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Benjamin James Lansdell

Curriculum Vitae

Current position

Postdoctoral Researcher, *University of Pennsylvania*, Philadelphia, Department of Bioengineering.

Areas of specialization

Computational neuroscience, Causal inference, Deep Learning

Education

2017 **PhD in Applied Mathematics**, *University of Washington*, Seattle, GPA: 3.84/4.0.
Advisor: Adrienne Fairhall

2012 **MPhil in Mathematics**, *University of Melbourne*, Australia, GPA: 84/100.
Advisors: Terence Speed, Kerry Landman

2008 **BSc (with honours)**, *University of Melbourne*, Australia, GPA: 89/100.
Major in Mathematics
Advisors: Anthony Papenfuss, Terence Speed

Experience

Research

2017-present **Postdoctoral researcher**, *University of Pennsylvania*, Philadelphia, Kording lab, Department of Bioengineering.

2017 **Senior Fellow**, *University of Washington*, Seattle, Fairhall lab, Department of Physiology and Biophysics.

2009 **Research Technician**, *Walter and Eliza Hall Institute for Medical Research*, Australia, Speed lab, Bioinformatics division.

2007 **Undergraduate Research Opportunities Program Student**, *Walter and Eliza Hall Institute for Medical Research*, Australia, Speed lab, Bioinformatics division.

Teaching

2020 **Teaching Assistant**, *University of Pennsylvania*, Philadelphia, Department of Computer and Information Science.
Deep Learning for Data Science

2013,2015 **Guest Lecturer**, *University of Washington*, Seattle, Department of Applied Mathematics.
Introduction to Nonlinear Dynamics and Chaos, Mathematics of Genome Analysis and Molecular Modeling

2010-2012 **Teaching Assistant**, *University of Washington*, Seattle, Departments of Mathematics and Applied Mathematics.
Fourier Analysis and Partial Differential Equations, Introduction to Nonlinear Dynamics and Chaos, Algebra in Business and Economics, Calculus with Analytic Geometry II

2006-2007 **Mathematics and physics tutor**, *University of Melbourne*, Australia, Queen's College, Ormond College.

Additional professional training

2018 **Visiting scholar**, *MILA*, Montreal, Canada.

Deep learning and reinforcement learning summer school, *University of Toronto*, Toronto, Canada.

2016 **Graduate Summer School – The Mathematics of Data**, *Park City Mathematics Institute/Institute for Advanced Study*, Utah.

2015 **Summer Institute in Statistics and Modeling in Infectious Diseases**, *Department of Biostatistics, University of Washington*, Seattle.

2014 **OIST Computational neuroscience course**, *Okinawa Institute of Science and Technology*, Okinawa, Japan.

Publications & talks

Submitted

Lansdell B, Triantafillou S, Kording K, "Rarely-switching linear bandits: optimization of causal effects for the real world" arXiv preprint arXiv:1905.13121

Lansdell B, Kording K, "Spiking allows neurons to estimate their causal effect", bioRxiv https://doi.org/10.1101/253351

Refereed articles

2020 **Lansdell B**, Milovanovic I, Mellema C, Fairhall A, Fetz E, Moritz C, "Reconfiguring motor circuits for a joint manual and BCI task" *IEEE Trans. Neural Systems and Rehabilitation Engineering*, 28(1); http://dx.doi.org/10.1109/TNSRE.2019.2944347

2019 **Lansdell B**, Kording K, "Towards learning-to-learn" *Current Opinion in Behavioral Science*, 29, 45-50

Farhoodi R*, **Lansdell B***, Kording K, "Quantifying how staining methods bias measurements of neuron morphologies" (equal first author), *Frontiers in Neuroinformatics* http://dx.doi.org/10.3389/fninf.2019.00036

2016 Aljadeff Y, **Lansdell B**, Fairhall A, Kleinfeld D, "Analysis of neuronal spike trains, deconstructed," *Neuron* 2016, 91(2)

Pang R, **Lansdell B**, Fairhall A, "Dimensionality Reduction in Neuroscience", *Current Biology* 2016, 26: R1-R5

2014 **Lansdell B**, Ford K, Kutz J N, "A reaction-diffusion model of cholinergic retinal waves", *PLoS Computational Biology* 2014, 10(12): e1003953

Garsed DW, Marshall OJ, Corbin VDA, Hsu A, Stefano LD, Schröder J, Li J, Feng Z, Kim BW, Kowarsky M, **Lansdell B**, Brookwell R, Myklebost O, Meza-Zepeda L, Holloway AJ, Pedeutour F, Choo KH, Damore MA, Deans AJ, Papenfuss AT, Thomas DM, "The Architecture and Evolution of Cancer Neochromosomes," *Cancer Cell* 2014, 26:653-667

2011 Renfree MB, Papenfuss AT, Deakin JE, [and 100 other authors, including **Lansdell B**], "Genome sequence of an Australian kangaroo, Macropus eugenii, provides insight into the evolution of mammalian reproduction and development.", *Genome Biology* 2011, 12:R81.

Refereed conference & workshop presentations

2020 **Lansdell B** "Towards intervention-centric causal reasoning in learning agents" ICLR 2020 workshop on Causal Learning and Decision Making, Addis Ababa, Ethiopia

Lansdell B, Prakash P, Kording K, "Learning to solving the credit assignment problem" ICLR 2020, Addis Ababa, Ethiopia

2019 **Lansdell B**, Prakash P, Kording K, "Learning to solve the credit assignment problem", NeurIPS Neuro+AI workshop 2019, Vancouver, BC, CAN. (poster)

Cheng J, Benjamin A, **Lansdell B**, Kording K, "Augmenting Supervised Learning by Meta-learning Unsupervised Local Rules", NeurIPS Neuro+AI workshop 2019, Vancouver, BC, CAN. (poster)

Lansdell B, Prakash P, Kording K, "Do neurons learn how to learn?", Cosyne Meeting 2019, Lisbon, Portugal. (poster)

2018 Farhoodi R*, **Lansdell B***, Kording K, "Quantifying the effect of staining methods on extracted neuron morphology", CCN Meeting 2018, Philadelphia, PA, USA. (equal first author) (poster)

Lansdell B, Kording K, "Spiking allows neurons to estimate their causal effect", Cosyne Meeting 2018, Denver, CO, USA. (poster)

2016 **Lansdell B**, Milovanovic I, Fairhall A, Fetz E, Moritz C, "Neural activity in a simultaneous BCI and manual task", Proc. of 6th Int. BCI Society Meeting 2016. DOI: 10.3217/978-3-85125-467-9-118 (poster)

Select talks & seminars

2020 **Lansdell B** (October 24, 2020), (*upcoming*) "Causality through learning-to-learn", Society for Neuroscience minisymposium. (Invited)

Lansdell B (February 27, 2020), "Causal considerations in deep and reinforcement learning", Applied mathematics seminar, Drexel University. (Invited)

Lansdell B (February 13, 2020), "Is the brain a computer?", Physics undergraduate seminar, Western University, London, ON.

Lansdell B (February 13, 2020), "The neuronal credit assignment problem as causal inference", Physics colloquium, Western University, London, ON. (Invited)

Lansdell B (February 6, 2020), "The neuronal credit assignment problem as causal inference", Rutgers-Newark Department of Mathematics & Computer Science, Newark, NJ. (Invited)

Lansdell B (January 24, 2020), "The neuronal credit assignment problem as causal inference", CNI seminar, Department of Neuroscience, University of Pennsylvania.

2019 **Lansdell B** (July 1, 2019), "The neuronal credit assignment problem as causal inference", MIT-IBM AI Watson lab, Boston.

Lansdell B (May 1, 2019), "Causality and reinforcement learning: considerations for smarter agents", CNI +/- seminar, Department of Neuroscience, University of Pennsylvania.

Lansdell B (March 22, 2019), "Optimizing policies with thresholds in neuroscience and medicine", AMS Sectional Meeting, University of Hawaii. (Invited)

2018 **Lansdell B** (August 21, 2018), "Causality and reinforcement learning: considerations for smarter agents", Neuro+ML theory talk, MILA, University of Montreal.

Lansdell B, Kording K, "Spiking allows neurons to estimate their causal effect", Deep Learning Reinforcement Learning Summer School 2018, CIFAR, Toronto, CAN. (poster)

2017 **Lansdell B** (June 5, 2017), "Neural population dynamics in motor control and development", Geffen lab talk, University of Pennsylvania. (Invited)

Lansdell B (May 30, 2017), "Neural population dynamics in motor control and development", Shirley Ryan Ability lab, Chicago. (Invited)

Lansdell B (March 24, 2017), "Moving models of motor control forward, in theory and application", *Special seminar*, Flatiron Institute, Simons Foundation, New York. (Invited)

Lansdell B (January 25, 2017), "Neuron tracking in hydra", *Yuste lab meeting*, Columbia University, New York.

Lansdell B (January 24, 2017), "Unraveling principles of motor control: from nerve nets to neural prosthetics", *Special seminar*, Janelia Research Campus, Ashburn VA. (Invited)

Lansdell B (January 23, 2017), "Unraveling principles of motor control: from nerve nets to neural prosthetics", *Neurotheory group talk*, Columbia University, New York. (Invited)

2013 **Lansdell B**, Kutz JN (July, 2013), "Cholinergic Retinal Waves and Self-Organized Criticality", *CNS 2013*, Paris, France. (poster)

2012 **Lansdell B**, Kutz JN, Ford K (September, 2012), "Modeling Retinal Waves in Starburst Amacrine Cells", *Neuroinformatics 2012*, Munich, Germany. (poster)

Lansdell B (June 12, 2012), "Modeling Retinal Waves in Starburst Amacrine Cells", *SIAM Conference on Non-linear Waves and Coherent Structures*, University of Washington, Seattle. (Invited)

Lansdell B (February 11, 2012), "Continuum Models of Retinal Waves in Starburst Amacrine Cells", *Frontiers in Biophysics*, Simon Frasier University, Vancouver. (Contributed)

Lansdell B (July 13, 2010), "Understanding the Bcl2 family through computational modelling", *Bioinformatics seminar*, Walter and Eliza Hall Institute, Melbourne, Australia.

2009 **Lansdell B** (May 26, 2009), "Improving the Mosquito Genome Annotation", *Bioinformatics seminar*, Walter and Eliza Hall Institute, Melbourne, Australia

2008 **Lansdell B**, Papenfuss AT, Speed TP, (December 2008) "Incorporating Tiling Array Expression Data into a Gene Predictor", *Genome Informatics Workshop*, Gold Coast, Australia. (poster)

Theses & unpublished work

2018 Lagache T, **Lansdell B**, Tang J, Yuste R, Fairhall A, "Tracking Activity In A Deformable Nervous System With Motion Correction And Point-Set Registration", *bioRxiv https://doi.org/10.1101/373035*

2012 **Lansdell B**, *Understanding the Bcl-2 family through computational modelling*, Masters thesis, Department of Mathematics and Statistics, University of Melbourne, 2012.

2008 **Lansdell B**, *Computational gene prediction using generalised hidden Markov models and tiling arrays*, Honours thesis, Department of Mathematics and Statistics, University of Melbourne, December 2008.

Honors & awards

2016 Travel grant to attend Graduate Summer School, Park City Mathematics Institute

2014 Travel grant to attend Okinawa Computational neuroscience course, OIST

2010 Top Scholar Award, University of Washington, Department of Applied Mathematics

2008 Dwight's Prize in Mathematical Statistics, University of Melbourne

2008 Alan W. Harris Scholarship, Walter and Eliza Hall Institute

2006 Melbourne Abroad Scholarship (University of Nottingham)

2006 MacFarland Scholarship, Ormond College

2004-2006 Ormond College Scholar, Ormond College

2003 Australian Students Prize, Australian government

2003 Dux (Valedictorian), Ballarat Clarendon College

Affiliations

2019 - present UPenn MindCore affiliate

2013 - present OCNS member

2011 - 2017 SIAM member

2011 - 2017 AMS member

2013 - 2014 BMES member

Service & responsibilities

Refereed for Nature Communications, Neuron, NeurIPS, Cosyne, Cognitive Computation

2020 **Workshop organizer**, (Upcoming) *Cosyne 2020*, Memory, Modularity & Attention: efficient information dispatching in neural computations, Breckenridge, CO.

2015 - 2017 **UAW Student Union Steward**, *University of Washington*, Department of Applied Mathematics representative.

2012 - 2016 **Computer Systems Administrator**, *University of Washington*, Department of Applied Mathematics.
Built and maintained Applied Mathematics department website (WordPress), maintained inhouse software *scorelator* (automated grading software), applied and secured funding for department computing resources (GPU machines).

2011 - 2013 **Graduate student representative for computing**, *University of Washington*, Department of Applied Mathematics.

Volunteer & outreach

2014 Fossil technician, Burke Museum of Natural History, University of Washington

2013-2014 Co-organizer of SIAM UW chapter math fair at Lockwood Elementary School

2013 Volunteer for UW Bridge program for incoming STEM students

Computer skills

Proficient Python, MATLAB, Maple, LaTeX, AUTO, git version control, WordPress CMS, MySQL, TensorFlow

Working knowledge C, C++, R, HTML, shell script, PHP, OpenGL, OpenCV, CUDA, pytorch