

Benjamin James Lansdell

Curriculum Vitae

Department Developmental Neurobiology
St Jude Children's Research Hospital
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Current position

Lead Bioinformatics Analyst, *St Jude Children's Research Hospital*, Memphis, Department of Developmental Neurobiology.

Areas of specialization

Computational neuroscience, Bioinformatics, 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

- 2020-present **Lead Bioinformatics Analyst**, *St Jude Children's Research Hospital*, Memphis, Department of Developmental Neurobiology.
- 2017-2020 **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

Baker B, **Lansdell B**, Kording K, “A Philosophical Understanding of Representation in Neuroscience”, arXiv preprint arXiv:2102.06592

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

- 2021 Yang S, Wang J, Gao T, Hu Z, Deng B, **Lansdell B**, Linares-Barranco B, “Efficient Neuromorphic Learning with Dendritic Event-driven Processing” *Front. Neurosci.* 2021, 15, 1-15
- 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, Pedoutour 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

- Lansdell B** (July 22, 2020), “The neuronal credit assignment problem as causal inference”, (Virtual) Bioinformatics seminar, St Jude Children’s Research Hospital, Memphis, TN. (Invited)
- Lansdell B** (April 28, 2020), “The neuronal credit assignment problem as causal inference”, (Virtual) Mahoney Institute for Neurosciences (MINS) UnRetreat Symposium Year of Brain Science Technology.
- 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 Fraser 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

- 2021 Third place in MABE online machine learning competition for animal behavior classification (run on aicrowd.com)
- 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

- 2013 - present OCNS member
- 2011 - '17; '21 SIAM member
- 2019 - 2020 UPenn MindCore affiliate
- 2011 - 2017 AMS member
- 2013 - 2014 BMES member

Service & responsibilities

- Refereed for IEEE Computational Intelligence Magazine, Cosyne, Cognitive Computation
- 2020 **Workshop organizer**, *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, L ^A T _E X, AUTO, git version control, WordPress CMS, MySQL, TensorFlow
Working knowledge	C, C++, R, HTML, shell script, PHP, OpenGL, OpenCV, CUDA, pytorch