Andrew Kyle Lampinen

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Education	**Stanford University,** Ph.D. Psychology (Cognitive), 2015-2020

- Advisor: James L. McClelland.
- Center for Mind, Brain, Computation, and Technology Trainee (Co-Mentor: Surya Ganguli).
- Minor in Computer Science.

UC Berkeley, B.A. Mathematics, Physics, 2010-2014

- Highest honors in mathematics, high distinction in general scholarship.

Honors

Ric Weiland Graduate Fellowship in the Humanities and Sciences, 2018-2020
National Science Foundation Graduate Research Fellowship, 2015-2018
Percy Lionel Davis Award for Excellence in Scholarship in Mathematics, 2014
Berkeley Physics Olsen Scholar 2013-2014
Berkeley Letters & Science Dean's List 2012-2014
Berkeley Physics Undergraduate Research Scholar, Spring & Fall 2012

Research Experience

PhD Candidate, Stanford University Department of Psychology, August 2015 - Present

- Empirical and theoretical investigations of generalization, transfer, and abstraction in deep learning models.
- Research on reducing the quantity of data required to train a deep learning system, including transfer, memory, and curriculum learning.
- Research on zero-shot performance of new tasks by transforming task representations.
- Experiments to investigate the effects of presentations of concepts on learning of related concepts in mathematical cognition.

PhD Intern, DeepMind, May 2019 - September 2019

- Explored automated curriculum generation for goal-conditioned reinforcement learning.
- Explored generalization in reinforcement learning.

PhD Software Engineering Intern, Google Brain, June 2017 - September 2017

- Designed and developed a system for using low-quality data from human interactions to improve an adversarially trained image generative model.
- Contributed gradients to TensorFlow image resizing ops.

Associate Professional Staff I, Johns Hopkins University Applied Physics Laboratory, June 2014 - July 2015

- Worked on image classification using convolutional neural networks.
- Developed models and simulations of sensor systems, shipping and transportation, and autoimmune diseases.
- Devised metrics for assessing sensors.
- Worked on methods for identifying malicious software based on its behavior.

Student Research Associate, Lawrence Berkeley National Laboratories, January - May 2012 & August - December 2012

- Developed simulations of processes in nuclear physics.

- Engineered software and hardware for efficiently collecting & analyzing data.

Summer Research Intern, A*STAR Institute of High Performance Computing, Singapore, June - August 2012
- Wrote and adapted simulations of crystallization processes in super-cooled metals.
- Developed software for analyzing and visualizing the structure of crystals.

Research Assistant, UC Davis Plant Sciences, June - August 2011
- Developed procedures and software for testing the physical attributes of fruit.

Publications and Proceedings	James L. McClelland, Bruce L. McNaughton, and **Andrew K. Lampinen** (2020), "Integration of new information in memory: new insights from a complementary learning sytems perspective", *Proceedings of the Royal Society B*
	Sébastien Racanière*, **Andrew K. Lampinen***, Adam Santoro, David P. Reichert, Vlad Firoiu, and Timothy P. Lillicrap, (2020), "Automated curricula through setter-solver interactions," *Proceedings of the 8th International Conference on Learning Representations*, (*equal contribution)
	Felix Hill, **Andrew K. Lampinen**, Rosalia Schneider, Stephen Clark, Matthew Botvinick, James L. McClelland, and Adam Santoro (2020), "Environmental drivers of systematicity and generalisation in a situated agent," *Proceedings of the 8th International Conference on Learning Representations*
	Andrew K. Lampinen and James L. McClelland, (2019), "Zero-shot task adaptation by homoiconic meta-mapping," *Learning Transferable Skills Workshop, NeurIPS*
	Andrew K. Lampinen and Surya Ganguli, (2019), "An analytic theory of generalization dynamics and transfer learning in deep linear networks," *Proceedings of the 7th International Conference on Learning Representations*
	Andrew K. Lampinen and James L. McClelland, (2018), "Different presentations of a mathematical concept can support learning in complementary ways," *Journal of Educational Psychology*
	Robert X. D. Hawkins, Eric N. Smith, Carolyn Au, Juan Miguel Arias, Rhia Catapano, Eric Hermann, Martin Keil, **Andrew Lampinen**, Sarah Raposo, Jesse Reynolds, Shima Salehi, Justin Salloum, Jed Tan, and Michael C. Frank, (2018), "Improving the replicability of Psychological Science through pedagogy," *Advances in Methods and Practices in Psychological Science*
	Steven S. Hansen, **Andrew K. Lampinen**, Gaurav Suri, and James L. McClelland, (2017), "Building on prior knowledge without building it in," *Commentary in Behavioral & Brain Sciences*
	Andrew K. Lampinen, Shaw Hsu, and James L. McClelland, (2017), "Analogies emerge from learning dynamics in neural networks," *Proceedings of the 39th Annual Meeting of the Cognitive Science Society*
Preprints and Submitted Manuscripts	**Andrew K. Lampinen** and James L. McClelland, (under review), "Transforming task representations to allow deep learning models to perform novel tasks," *arXiv*
	Katherine L. Hermann* and **Andrew K. Lampinen***, (under review), "What shapes feature representations? Exploring datasets, architectures, and training," (*equal contribution)
	Andrew K. Lampinen and James L. McClelland, (2017), "One-shot and few-shot learning of word embeddings," *arXiv*
	Andrew K. Lampinen, David So, Douglas Eck, and Fred Bertsch, (2017), "Improving image generative models with human interactions," *arXiv*
Invited Talks	"Multi-task learning, transfer, and abstraction," *Parallel Distributed Processing and the Emergence of an Understanding of Mind*, Princeton University, September 29th,

2018

"The Jabberwocky: One-shot and few-shot learning of word embeddings," *Meaning in Context Workshop*, Center for the Study of Language and Information, Stanford University, September 12th, 2017

Presentations	"Automated curricula through setter-solver interactions," *8th International Conference on Learning Representations*, 2020
	"Environmental drivers of systematicity and generalisation in a situated agent," *8th International Conference on Learning Representations*, 2020
	"Zero-shot task adaptation by homoiconic meta-mapping," *Learning Transferable Skills Workshop, NeurIPS*, 2019
	"An analytic theory of generalization dynamics and transfer learning in deep linear networks," Natural / Artificial Intelligence, Stanford Neurosciences Institute, 2018
	"An analytic theory of generalization dynamics and transfer learning in deep linear networks," Parallel Distributed Processing and the Emergence of an Understanding of Mind, Princeton University, 2018
	"Analogies emerge from learning dynamics in neural networks," 39th Annual Meeting of the Cognitive Science Society, 2017
	"Fast and sparse learning with compositional concept training," 15th Neural Computation and Psychology Workshop, 2016

Teaching Experience	**Teaching Assistant,** Stanford University Department of Psychology, 6 courses between Fall 2016 and Winter 2019

- Planned and taught discussion sections for undergraduate statistics & memory courses and graduate statistics & research methods courses.
- Gave lectures on reinforcement learning and wrote and graded homeworks for graduate course on Neural Network Models of Cognition.
- Held office hours.

Undergraduate Student Instructor, UC Berkeley Mathematics, Spring, Fall 2013, & Spring 2014

- Planned and taught discussion sections.
- Held office hours.
- Wrote and graded quizzes and midterms.

Teaching Assistant, UC Berkeley Early Academic Outreach Program, June-July 2013

- Held office hours.
- Substitute taught classes.

Other Work Experience	**Statistics Consultant,** Stanford University Department of Psychology, 2016-2017, 2019-2020

- Advised graduate students on technical aspects of data collection, analysis, and modeling.

Service	**Reviewer:**

- Journal of Educational Psychology.
- Artificial Intelligence.
- Neural Information Processing Systems, 2020.
- Cognitive Science Society, 2019 & 2020.
- Conference on the Mathematical Theory of Deep Neural Networks (DeepMath), 2019

Technical Skills	**Computer science:** Experienced with both theory and practice.
	• Graduate coursework in machine learning, neural networks, and probabilistic models & algorithms.
	• Experienced user of Python, R, C++, C, JavaScript, Matlab, some knowledge of Mathematica, Macaulay2, Haskell.
	• Used many common libraries for these languages, e.g. numpy, scipy, tidyr, dplyr, jquery, matplotlib, Matlab Computer Vision Toolbox, FFTW.
	• Used many machine learning libraries, including TensorFlow, Torch, scikit-learn, and Caffe.
	• Experienced with *NIX operating systems.
	Mathematics: Knowledge across many domains, with applications.
	• Algebraic geometry, group theory, category theory, topology, etc.
	• Practical applications to machine learning, computer vision, neural coding, etc.
	Statistics: Significant experience with standard data analysis techniques.
	• Linear modeling, hierarchical modeling, etc.
	• Fitting algorithms & goodness-of-fit tests.
	Physics: Experienced in a wide variety of applied and experimental contexts.
	• Statistical mechanics, biophysics, analytic mechanics, etc.
	• Experimentation ranging from NMR to quantum entanglement.
	Modeling & Simulation: Developed models and simulations of various phenomena.
	• Developed both from published methods and directly from physical principles.
Other Activities	**Carillon:** Carilloneur member of the Guild of Carilloneurs in North America (`www.gcna.org`).
	Rock climbing: Bouldering, sport, and trad. Routesetter at Stanford Climbing Wall, set problems for Collegiate Climbing Series events.