

Brenden Lake
brenden@nyu.edu

Positions:

New York University

Assistant Professor

Department of Psychology and Center for Data Science (joint)

September 2017-present

Moore-Sloan Data Science Fellow

Center for Data Science

July 2014-September 2017

Education:

Massachusetts Institute of Technology

Ph.D. in Cognitive Science, September 2014

- Thesis: Towards more human-like concept learning in machines: Compositionality, causality, and learning-to-learn
- Advisor: Joshua B. Tenenbaum

Stanford University

M.S., Symbolic Systems, June 2009

- Thesis: Unsupervised and semi-supervised perceptual category learning
- Track in Computational and statistical approaches to learning and inference
- Advisor: James L. McClelland

B.S., Symbolic Systems, June 2009

- Concentration in Cognitive Science
- With University Distinction

Publications
(Competitively
refereed):

- Rothe, A., Lake, B. M., and Gureckis, T. (submitted). Question Asking as Program Generation.
- Lake, B. M., and Piantadosi, S. T. (submitted). People infer recursive visual concepts from just a few examples.
- Lake, B. M., Lawrence, N., and Tenenbaum, J. B. (submitted). The emergence of organizing structure in conceptual representation. Preprint available on arXiv:1611.09384.
- Lake, B. M., Ullman, T. D., Tenenbaum, J. B., Gershman, S. J. (in press). Building machines that learn and think like people. *Behavioral and Brain Sciences*. (Target Article).
- Rothe, A., Lake, B. M., and Gureckis, T. (2016). Asking and evaluating natural language questions. *Proceedings of the 38th Annual Conference of the Cognitive Science Society*.
- Cohen, A. and Lake, B. M. (2016). Searching large hypothesis spaces by asking questions. *Proceedings of the 38th Annual Conference of the Cognitive Science Society*.
- Lake, B. M., Salakhutdinov, R., Tenenbaum, J. B. (2015). Human-level concept learning through probabilistic program induction. *Science*, 350(6266), 1332-1338. (Featured as cover article)
- Monfort, M., Ziebart, B., Lake, B. M., Tenenbaum, J. B. (2015). Softstar: Heuristic-Guided Probabilistic Inference. *Advances in Neural Information Processing Systems (NIPS) 28*.
- Lake, B. M., Zaremba, W., and Gureckis, T. (2015). Deep neural networks predict category typicality ratings for images. *Proceedings of the 37th Annual Conference of the Cognitive Science Society*.
- Lake, B. M., Lee, C.-y., Tenenbaum, J. B. (2014). One-shot learning of generative speech concepts. In *Proceedings of the 36th Annual Conference of the Cognitive Science Society*.
- Lake, B. M., Salakhutdinov, R., Tenenbaum, J. B. (2013). One-shot learning by inverting a compositional causal process. *Advances in Neural Information Processing Systems (NIPS) 26*.
- Lake, B. M., Salakhutdinov, R., Tenenbaum, J. B. (2012). Concept learning as motor program induction: A large-scale empirical study. In *Proceedings of the 34th Annual Conference of the Cognitive Science Society*.
- Lake, B. M., Salakhutdinov, R., Gross, J., and Tenenbaum, J. B. (2011). One shot learning of simple visual concepts. In *Proceedings of the 33rd Annual Conference of the Cognitive Science Society*.
- Lake, B. M. and McClelland, J. L. (2011). Estimating the strength of unlabeled information during semi-

- supervised learning. In *Proceedings of the 33rd Annual Conference of the Cognitive Science Society*.
 - Lake, B. M. and Tenenbaum, J. B. (2010). Discovering Structure by Learning Sparse Graphs. In *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*.
 - Lake, B. M., Vallabha, G. K., and McClelland, J. L. (2009). Modeling unsupervised perceptual category learning. *IEEE Transactions on Autonomous Mental Development*, 1(1), 35-43.
 - Lake, B. M., Vallabha, G. K., and McClelland, J. L. (2008). Modeling unsupervised perceptual category learning. In *Proceedings of the 7th International Conference on Development and Learning (ICDL)*.
 - Lake, B. M. and Cottrell, G.W. (2005). Age of acquisition in facial identification: A connectionist approach. In *Proceedings of the 27th Annual Conference of the Cognitive Science Society*.
- Funding:
- NSF I-Corps for Learning Grant (as Principal Investigator), “Learning-to-learn with touchscreen technology,” Dec. 2014 – June 2015.
 - NYU Center for Brain Imaging, “Neural basis of perceiving handwritten characters,” 2015.
 - NVIDIA Hardware Grant, “Understanding the Psychology of Deep Neural Networks,” 2015.
 - National Science Foundation (NSF) Graduate Research Fellowship, 2011-2014.
 - Singleton Presidential Fellowship, Massachusetts Institute of Technology, 2009-2010.
- Honors and Awards:
- Research honored as one of “10 World Changing Ideas,” *Scientific American*, 2016.
 - Featured as Data Innovator, Center for Data Innovation, January 2015.
 - Robert J. Glushko Prize for Outstanding Doctoral Dissertation in Cognitive Science, 2015.
 - Angus MacDonald Award for Excellence in Teaching Undergraduate Students, 2010.
 - Elected to Phi Beta Kappa, 2009.
 - Best paper award, *International Conference on Development and Learning (ICDL)*, 2008.
- Media:
- Research featured in the *New York Times*, *Washington Post*, *Los Angeles Times*, *Seattle Times*, *Christian Science Monitor*, *Toronto Star*, *Reuters*, *Popular Mechanics*, *Fortune*, *CBS News*, *NBC News*, *MIT Technology Review*, *Business Insider*, *IEEE Spectrum*, *Motherboard*, *La Recherche*, *Popular Science*, and many other outlets. Also featured on CBS Radio, BBC Radio, and the *Science Magazine* podcast.
 - Research featured in “Top A.I. Breakthroughs of 2015” (The Future of Life Institute), and “What Do You Consider the Most Interesting Recent Scientific News?” (Edge.com 2016 Annual Question).
 - Media impact score, “Human-level concept learning” ranked 16 of 31,000 papers ever published in *Science* (Altmetric.com; on 1/19/2016). It is the highest scoring scientific output from NYU (3/2015 – 2/2016).
- Teaching:
- Advisor, Practical Training for Data Science, DS-GA 1009, NYU, Fall 2016.
 - Instructor, Practical Training for Data Science, DS-GA 1009, NYU, Fall 2015.
 - Teaching Assistant, Cognitive Processes, MIT, Spring 2012.
 - Teaching Assistant, Laboratory in Visual Cognition, MIT, Fall 2010.
 - Grader, Machine Learning Course, Computer Science Department, Stanford, 2008.
- Service:
- Reviewer for *Proceedings of the National Academy of Sciences (PNAS)*, *Cognition*, *Journal of Experimental Psychology: General*, *Cognitive Science*, *Psychonomic Bulletin & Review*, *Memory & Cognition*, *Vision Research*, *Big Data*, *Frontiers in Psychology*, Annual Conference of the Cognitive Science Society (*CogSci*), Advances in Neural Information Processing Systems (*NIPS*), and International Conference on Artificial Intelligence and Statistics (*AISTATS*).
 - Mentor, Artificial Intelligence NexusLab Incubator, New York City, Fall 2016-Present.
 - Organizer, Data Science Lunch Seminar Series, Fall 2015.
 - Organizer, NYU Computation and Cognition meetings, Fall 2014-Spring 2015.
 - Organizer, NYU Concepts and Categories (ConCats) seminar series, Fall 2014-Spring 2015.
 - Advising fellow, Symbolic Systems Program, Stanford University, 2008-2009.
- Invited talks:
- Keynote Speaker, NYU Computational Neuroscience Symposium, June 2017.
 - New York University, Cognition and Perception Seminar, Mar. 2017.
 - University of Toronto, Department of Computer Science Lecture, Mar. 2017
 - UC Berkeley, Department of Psychology / Cognitive Science Colloquium, Feb. 2017.

- University of Washington, Computer Science and Engineering Colloquium, Feb. 2017.
- Stanford University, Department of Psychology Colloquium, Feb. 2017.
- Invited Speaker, New York Artificial Intelligence Meetup, Jan. 2017.
- Invited Speaker, Neural Information Processing Systems (NIPS), Workshop on “Machine Intelligence,” Dec. 2016.
- Stanford University, EE Computer Systems Colloquium, Oct. 2016.
- Qualcomm Research, Santa Clara, CA, Sept. 2016.
- Invited Speaker, International Joint Conference on Artificial Intelligence (IJCAI), Workshop on “Interactive Machine Learning: Connecting Humans and Machines,” July 2016.
- Invited Speaker, International Conference on Machine Learning (ICML), Workshop on “Data-Efficient Machine Learning,” June 2016.
- Invited Speaker, International Conference on Machine Learning (ICML), Workshop on “Deep Learning,” June 2016.
- Google DeepMind, London, May 2016.
- Facebook Artificial Intelligence Research (FAIR), New York, April 2016.
- New York University (NYU), Computational Intelligence, Learning, Vision, and Robotics (CILVR), April 2016.
- Rutgers University-Newark, Seminar on “This is Data Science,” Institute for Data Science, Mar. 2016.
- Invited Speaker, NYC Machine Learning Meetup, Mar. 2016.
- Moore-Sloan Data Science Summit, Cle Elum, WA, Oct. 2015.
- Symposium for Glushko Dissertation Prize, Annual Conference of the Cognitive Science Society, July 2015.
- Invited Speaker, CodeNeuro, New York City, April 2015.
- New York University (NYU), 4th Data Science Showcase, Oct. 2014.
- Invited Speaker, Eastern Psychological Association, Symposium on “Computational Constructivism,” Mar. 2014.
- New York University (NYU), Computational Intelligence, Learning, Vision, and Robotics (CILVR), Feb. 2014.
- Bay Area Cognitive Science Group, Dec. 2013.
- New York University (NYU), Seminar on Concepts and Categories (ConCats), Sept. 2013.
- MIT Spoken Language Systems Group, April 2013.