

## EDUCATION

### Stanford University

*Ph.D. Candidate in Computer Science* September 2011 – December 2017 (expected)

- Advisor: Prof. Surya Ganguli
- Thesis: Computational tools for understanding biological and artificial neural networks
- Areas of Study: deep learning, neuroscience, unsupervised learning, computer vision

### Carnegie Mellon University

*B.S. in Computer Science, additional major in Cognitive Science. GPA: 3.9/4.0.* Fall 2007 - Spring 2011

- Advisor: Prof. Tai Sing Lee
- Senior Thesis: Encoding natural priors in neural populations

## WORK EXPERIENCE

### Stanford University

*Graduate Research with Surya Ganguli* Fall 2012 – present

- Developed techniques for analyzing and understanding large-scale neural datasets
- Exploring new techniques for semi-supervised and unsupervised learning
- Building new theoretical approaches for understanding deep neural networks

*Teaching Assistant*

Winter 2015, Spring 2017

- CS231N: Convolutional Neural Networks for Visual Recognition

### DeepMind

*Research Intern* Summer 2017

- Investigated new approaches to unsupervised learning with hierarchical generative models

### Google

*Software Engineering Intern, Google Brain* Summer 2016

- Designed new algorithms for unsupervised learning with generative adversarial networks
- Implemented new approach to semi-supervised learning with latent categorical variables

*Software Engineering Intern, Google Research* Summer 2015

- Developed improvements to the bilateral solver, an efficient technique for edge-aware smoothing
- Integrated the bilateral solver into deep networks for optical flow and semantic segmentation

*Software Engineering Intern* Summer 2011

- Worked on a new framework to automate the collection, preprocessing, and training of adversarial models to combat spam and fraudulent activity

### Carnegie Mellon University

*Undergraduate Fellow, Center for the Neural Basis of Cognition* Spring 2010 – Spring 2011

- Developed methods to learn neural representations from statistics of natural scenes
- Created a framework for automated analysis and visualization of spiking neural data

### New York University

*NSF REU SURP Student, Center for Neural Science* Summer 2009

- Implemented algorithms for real-time decoding of cognitive state from electrode recordings

### Intel Research

*IFYRE Researcher* Spring 2008, Fall 2008, Spring 2009

- Created and deployed a program to correct for the respiratory motion of lung tumors in CT scans
- Developed software to detect the signal quality of optical coherence tomography images

### US Army Research Lab – Aberdeen, MD

*Consultant/Analyst, Quantum Research International* June 2007 – August 2008

- Designed a tool for BRL-CAD to model 3d voxel data out of primitive shapes using genetic algorithms

## AWARDS

|   |                           |
|---|---------------------------|
| Seth A. Ritch Bio-X Stanford Interdisciplinary Graduate Fellow      | September 2014-2017       |
| NSF IGERT Trainee, Stanford Center for Mind, Brain, and Computation | September 2012-2014       |
| Edward J. McCluskey Engineering Graduate Fellowship                 | September 2011-2012       |
| Phi Beta Kappa and Phi Kappa Phi, Carnegie Mellon University        | Spring 2011               |
| NIH Computational Neuroscience Research Fellowship                  | Summer 2010 - Spring 2011 |

## PUBLICATIONS

- B. Poole\***, F. Zenke\*, S. Ganguli. Continual learning through synaptic intelligence. ICML 2017.
- M. Raghu, **B. Poole**, J. Kleinberg, S. Ganguli, J. Sohl-Dickstein. On the expressive power of deep neural networks. ICML 2017.
- E. Jang, S. Gu, **B. Poole**. Categorical reparameterization with Gumbel-Softmax. ICLR 2017.
- L. Metz, **B. Poole**, D. Pfau, J. Sohl-Dickstein. Unrolled generative adversarial networks. ICLR 2017.
- V. Dumoulin, I. Belghazi, **B. Poole**, A. Lamb, M. Arjovsky, O. Mastropietro, A. Courville. Adversarially learned inference. ICLR 2017.
- B. Poole**, S. Lahiri, M. Raghu, J. Sohl-Dickstein, S. Ganguli. Exponential expressivity in deep neural networks through transient chaos. NIPS 2016.
- B. Poole\***, J. Leong\*, J. Esch\*, S. Ganguli, T. Clandinin. Direction Selectivity in Drosophila Emerges from Preferred-Direction Enhancement and Null-Direction Suppression. The Journal of Neuroscience 2016.
- J. T. Barron, **B. Poole**. The Fast Bilateral Solver. ECCV 2016. Honorable mention for best paper.
- J. Sohl-Dickstein, **B. Poole**, S. Ganguli. Fast large-scale optimization by unifying stochastic gradient and quasi-Newton methods. ICML 2014.
- J. R. Anderson, D. Bothell, J. M. Fincham, A. R. Anderson, **B. Poole**, Y. Qin. Brain Regions Engaged by Part- and Whole-task Performance in a Video Game: A Model-based Test of the Decomposition Hypothesis. Journal of Cognitive Neuroscience, 2011, 23, 3983-3997.

## CONFERENCE ABSTRACTS AND PRESENTATIONS

- B. Poole\***, A. Williams\*, N. Maheswaranathan\*, B. Yu, G. Santhanam, S. Ryu, S. Baccus, K. Shenoy, S. Ganguli. Time-warped PCA: simultaneous alignment and dimensionality reduction of neural data. COSYNE 2017.
- B. Poole**, J. Sohl-Dickstein, A. Angelova. Improved generator objectives for GANs. NIPS Adversarial Training Workshop 2016.
- J. Leong\*, **B. Poole\***, S. Ganguli, T. Clandinin. Constraining the mechanisms of direction selectivity in a fruit fly elementary motion detector. COSYNE 2015.
- B. Poole**, L. Grosenick, M. Broxton, K. Deisseroth, S. Ganguli. Robust non-rigid alignment of volumetric calcium imaging data. COSYNE 2015.
- Y. Zhang, X. Li, J. Samonds, **B. Poole**, T.S. Lee. Relating functional connectivity in V1 neural circuits and 3D natural scenes using Boltzmann machine. COSYNE 2015.
- J. Sohl-Dickstein, N. Maheswaranathan, **B. Poole**, S. Ganguli. Efficient fitting of large-scale neural models. COSYNE 2014.
- B. Poole**, J. Sohl-Dickstein, S. Ganguli. Analyzing noise in autoencoders and deep networks. NIPS workshop on deep learning 2013.
- E.A. Pnevmatikakis, T.A. Machado, L. Grosenick, **B. Poole**, J.T. Vogelstein and L. Paninski. Rank-penalized nonnegative spatiotemporal deconvolution and demixing of calcium imaging data, COSYNE 2013.
- G. Lindsay, **B. Poole**, B. Doiron, J. Samonds, T.S. Lee. Quality of tuning curves and their effect on population coding. COSYNE 2011.
- J.M. Samonds, **B. Poole**, T.S. Lee. V1 interactions reduce local uncertainty about binocular disparity over time. SFN 2010.
- B. Poole**, I. Lenz, G. Lindsay, J.M. Samonds, T.S. Lee. Connecting scene statistics to probabilistic population codes and tuning properties of V1 neurons. SFN 2010. Oral presentation.

\* indicates equal contribution