

Daniel Kunin

Education

Stanford University

M.S. Computational and Mathematical Engineering

Ph.D. Computational and Mathematical Engineering

Stanford, CA

September 2017 - June 2020

Matriculation June 2020

Brown University

Sc.B. Applied Mathematics, A.B. Computational Biology

Providence, RI

September 2013 - May 2017

Publications

The Asymmetric Maximum Margin Bias of Quasi-Homogeneous Neural Networks **Preprint 2022**
[Daniel Kunin](#)*, Atsushi Yamamura*, Chao Ma, Surya Ganguli [\(link\)](#)

Beyond the Quadratic Approximation: the Multiscale Structure of Neural Network Loss Landscapes **JMLR 2022**
[Chao Ma](#), [Daniel Kunin](#), Lei Wu, Lexing Ying [\(link\)](#)

Rethinking the limiting dynamics of SGD: modified loss, phase space oscillations, and anomalous diffusion **Preprint 2021**
[Daniel Kunin](#)*, Javier Sagastuy-Brena*, Lauren Gillespie, Eshed Margalit, Hidenori Tanaka, Surya Ganguli, Daniel L.K. Yamins [\(link\)](#)

Noether's Learning Dynamics: The Role of Kinetic Symmetry Breaking in Deep Learning **NeurIPS 2021**
[Hidenori Tanaka](#), [Daniel Kunin](#) [\(link\)](#)

Neural Mechanics: Symmetry and Broken Conservation Laws in Deep Learning Dynamics **ICLR 2021**
[Daniel Kunin](#)*, Javier Sagastuy-Brena, Surya Ganguli, Daniel L.K. Yamins, Hidenori Tanaka* [\(blog\)](#) [\(link\)](#)

Pruning neural networks without any data by iteratively conserving synaptic flow **NeurIPS 2020**
[Hidenori Tanaka](#)*, [Daniel Kunin](#)*, Daniel L.K. Yamins, Surya Ganguli [\(link\)](#)

Two Routes to Scalable Credit Assignment without Weight Symmetry **ICML 2020**
[Daniel Kunin](#)*, Aran Nayebi*, Javier Sagastuy-Brena*, Surya Ganguli, Jonathan M. Bloom, Daniel L.K. Yamins [\(link\)](#)

Loss Landscapes of Regularized Linear Autoencoders **ICML 2019**
[Daniel Kunin](#)*, Jonathan M. Bloom*, Aleksandrina Goeva, Cotton Seed [\(blog\)](#) [\(link\)](#)

Workshops/Talks

Sparsity in Neural Networks: Advancing Understanding and Practice **Virtual**
- Presented poster on theory of network pruning [\(link\)](#). [July 2021](#)

Physics \cap ML **Virtual**
- Gave talk of my work on symmetry in deep learning to audience of physicists and machine learning researchers [\(link\)](#) [February 2021](#)

Machine Learning and the Physical Sciences **Virtual**
- Presented poster on neural mechanics at NeurIPS 2020 workshop on the intersection of deep learning and physics [\(link\)](#) [December 2020](#)

DeepMath **Virtual**
- Presented poster on network pruning at conference on the Mathematical Theory of Deep Neural Networks [\(link\)](#) [November 2020](#)

Institute for Advanced Study **Princeton, NJ**
- Selected to give a "spotlight talk for young researchers" at *Workshop on Theory of Deep Learning: Where next?* [\(link\)](#) [October 2019](#)

International Conference on Machine Learning **Long Beach, CA**
- One of two papers on Representation Learning selected to give a 20 minute talk at the 2019 International Conference on Machine Learning [\(link\)](#) [June 2019](#)

Models, Inference and Algorithms **Cambridge, MA**
- Presented research on regularized linear autoencoders at Broad Institute's weekly seminar on the interface of biology and mathematics [\(link\)](#) [February 2019](#)

Work Experience

Research Intern at NTT Research	Virtual
-Researched the intersection of deep learning theory and physics	Jun 2021 - Sept 2021
Deep Learning Course Assistant	Stanford, CA
-Course assistant for Andrew Ng's deep learning class CS230	Sept 2018 - March 2019
Visiting Graduate Student at The Broad Institute of MIT and Harvard	Cambridge, MA
-Developed a deep learning model for matrix factorization	Jun 2018 - Sept 2018
-Researched a relationship between linear autoencoders with L2 regularization and orthogonality	
Deep Learning Visualizations Engineer	Palo Alto, CA
-Developed educational visualizations of deep learning models for Deeplearning.ai	April 2018 - Sept 2019
-Developed using D3.js and Tensorflow.js	
Undergraduate Researcher for Chip Lawrence Lab	Providence, RI
-Helped rewrite a HMM alignment software for paleoclimate data in Matlab	Jan 2017 - June 2017
-Designed and developed a web platform for using the HMM alignment software	
Front-End Web Developer	Providence, RI
-Used D3.js to create interactive visualizations of probability and statistics concepts	May 2016 - Dec 2016
-Designed and developed a web platform with over two million page views and users from nearly every country in the world: <i>seeingtheory.io</i>	

Awards/Fellowships

Open Philanthropy AI Fellowship	San Francisco, CA
- Part of cohort of eleven promising machine learning researchers selected across institutions	September 2022
- Full graduate stipend and tuition is covered for up to three years.	
Stanford Data Science Scholar	Stanford, CA
- Part of cohort of graduate students using data science in their research	January 2020
- Half my stipend and tuition is covered for two years.	
Citadel Data Open Championship	New York City, NY
-Investigated the effect of education, demographics, and economics on social mobility	November 2017
- Presented report to a panel of experts and placed in the top five teams.	
Citadel Data Open at Berkeley	Berkeley, CA
-Analyzed how Airbnb affects the local renting market in San Francisco	September 2017
-First place winner; \$20,000 award prize; One of 20 teams invited to compete in The Data Open Championship for a \$100,000 prize.	
Harvey A. Baker Fellowship	Providence, RI
-Awarded annually to outstanding members of the graduating class to aid them in undertaking graduate study at the university of their choice	May 2017
COMAP Interdisciplinary Contest In Modeling	Providence, RI
-Developed a queuing model for lines and servicing at TSA security	April 2017
-Outstanding Winner; one of fourteen teams that received this distinction out of 8085 teams that participated from eight countries	
Brown Mathematical Contest for Modeling	Providence, RI
-Developed a model and algorithm for optimizing the value of Pokemon caught	November 2016
-Outstanding Winner; one of two teams sponsored by Division of Applied Math to compete in the 2017 COMAP mathematical modeling competition	
Brown University Royce Fellowship	Providence, RI
-Designed and developed a web platform for learning probability and statistics	April 2016
-Lifetime membership in the Society of Royce Fellows	
Brown Mathematical Contest for Modeling	Providence, RI
-Developed a model for viral population growth and treatment.	November 2015
-Finalist Winner; cash prize	