

SUZANNA PARKINSON

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EDUCATION

University of Chicago, Chicago, IL

Ph.D., Computational and Applied Mathematics, Expected June 2026

Thesis: “The Role of Depth in Neural Networks: A Representation Cost Perspective”

Advisor: Rebecca Willett, Ph.D.

Brigham Young University, Provo, UT

B.S., Mathematics, April 2020, GPA: 3.99

RESEARCH INTERESTS

Mathematical foundations of deep learning and neural networks, especially the inductive bias associated with various network architectures and training algorithms. Analysis of algorithms for data science more broadly.

RESEARCH EXPERIENCE

University of Chicago, Chicago, IL

Graduate Researcher, Physical Sciences Division under Professor Rebecca Willett, October 2022 – Present

- Proved that more functions can be learned with polynomial sample complexity using three-layer ReLU networks than with two-layer ReLU networks
- Proved that the size of weights needed to represent functions using neural networks with many linear layers is related to how close the function is to being a multi-index model
- Analyzed how linear neural networks adapt to low-dimensional structure in data when trained via gradient descent with standard hyperparameter settings

Graduate Researcher, Physical Sciences Division under Professor Matthew Stephens, June 2021 – December 2022

- Developed algorithms to identify branching structure in data using matrix factorizations

Brigham Young University, Provo, UT

Mathematics Research Assistant under Professor Tyler Jarvis, March 2018 – August 2020

- Analyzed algorithms for finding zeros of nonlinear systems of equations

Physics Research Assistant under Professor Gus Hart, May 2018 – August 2018

- Derived formulas and wrote Python code for density functional theory calculations

National Security Agency, Fort G. Meade, MD

Intern, Director’s Summer Program, May 2019 – August 2019

- Conducted statistical analysis on an implementation of a popular post-quantum cryptographic algorithm
- Submitted detailed findings in an internal refereed technical paper

PAPERS & PUBLICATIONS

S. Parkinson, G. Ongie, R. Willett (2025). *ReLU Neural Networks with Linear Layers are Biased Towards Single- and Multi-Index Models*, SIAM Journal on Mathematics of Data Science.

H. Laus, **S. Parkinson**, V. Charisopoulos, F. Krahmer, R. Willett (2025). *Solving Inverse Problems with Deep Linear Neural Networks: Global Convergence Guarantees for Gradient Descent with Weight Decay*. arXiv:2502.15522

J. Blanc, M. Steiner, L. Blake, E. Gibbons, M. Ianni-Ravn, R. Morgan, **S. Parkinson**, C. Porras, E. Zhong (2025). *Ten simple rules for success as a trainee-led outreach organization in computational biology education*. PLOS Computational Biology.

S. Parkinson, G. Ongie, R. Willett, O. Shamir, N. Srebro (2024). *Depth Separation in Norm-Bounded Infinite-Width Neural Networks*, Conference on Learning Theory, Edmonton, Canada.

S. Parkinson, H. Ringer, K. Wall, E. Parkinson, L. Erikson, D. Christensen, T. Jarvis (2022). *Analysis of normal-form algorithms for solving systems of polynomial equations*, Journal of Computational and Applied Mathematics.