

# BO ZHAO

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## RESEARCH INTEREST

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Parameter space symmetry, optimization, deep learning theory

## EDUCATION

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**University of California San Diego** 2021–2026 (*Expected*)

*Ph.D. in Computer Science*

· Advisor: Rose Yu

**Georgia Institute of Technology** 2019–2021

*M.S. Computer Science*

**University of Illinois at Urbana-Champaign** 2016–2019

*B.S. Computer Science (with highest honors)*

*B.S. Physics (cum laude and departmental highest distinction)*

## EXPERIENCE

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**Capital One** New York, NY

*Applied Research Intern*

2025/6–2025/8

· Improve efficiency of reasoning models through prompt complexity analysis.

**NTT Research** Cambridge, MA

*Research Intern (Mentor: Hidenori Tanaka)*

2024/6–2024/9

· Studied representation and dynamics of emotion in large language models.

**IBM** Cambridge, MA

*AI Intern (Mentor: Nima Dehmamy)*

2022/6–2022/9

· Studied parameter space symmetry and conserved quantities in gradient flow.

## AWARDS & HONORS

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**Rising Stars in EECS**, MIT and Boston University 2025

**Rising Stars in Data Science**, Stanford University 2025

**NVIDIA Graduate Fellowship finalist** 2025

**Qualcomm Innovation Fellowship finalist** 2024

**DeepMind PhD Fellowship** 2023

## PUBLICATIONS

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### Conference

[1] Understanding Mode Connectivity via Parameter Space Symmetry.

**Bo Zhao**, Nima Dehmamy, Robin Walters, Rose Yu.

*International Conference on Machine Learning (ICML)*, 2025.

- [2] Understanding the Difficulty of Solving Cauchy Problems with PINNs.  
Tao Wang, **Bo Zhao**, Sicun Gao, Rose Yu.  
*The 6th Annual Learning for Dynamics and Control Conference (L4DC)*, 2024.
- [3] Improving Convergence and Generalization Using Parameter Symmetries.  
**Bo Zhao**, Robert M. Gower, Robin Walters, Rose Yu.  
*International Conference on Learning Representations (ICLR)*, 2024.  
**Oral presentation (top 1.2%)**.
- [4] DYffusion: A Dynamics-informed Diffusion Model for Spatiotemporal Forecasting.  
Salva Rühling Cachay, **Bo Zhao**, Hailey Joren, Rose Yu.  
*Advances in Neural Information Processing Systems (NeurIPS)*, 2023.
- [5] Symmetries, Flat Minima, and the Conserved Quantities of Gradient Flow.  
**Bo Zhao\***, Iordan Ganev\*, Robin Walters, Rose Yu, Nima Dehmamy. (\*equal contribution)  
*International Conference on Learning Representations (ICLR)*, 2023.
- [6] Symmetry Teleportation for Accelerated Optimization.  
**Bo Zhao**, Nima Dehmamy, Robin Walters, Rose Yu.  
*Advances in Neural Information Processing Systems (NeurIPS)*, 2022.
- [7] LIMO: Latent Inceptionism for Targeted Molecule Generation.  
Peter Eckmann, Kunyang Sun, **Bo Zhao**, Mudong Feng, Michael Gilson, Rose Yu.  
*International Conference on Machine Learning (ICML)*, 2022.
- [8] Concentric Spherical Neural Network for 3D Representation Learning.  
James Fox, **Bo Zhao**, Beatriz Gonzalez Del Rio, Sivasankaran Rajamanickam, Rampi Ramprasad, Le Song.  
*International Joint Conference on Neural Networks (IJCNN)*, 2022.

## Journal

- [1] Multiple Aging Mechanisms in Ferroelectric Deuterated Potassium Dihydrogen Phosphate.  
Gregory A. Fields, Samuel F. Cieszynski, **Bo Zhao**, Kidan A. Tadesse, Mohammed A. Sheikh, Eugene V. Colla, and M. B. Weissman.  
*Journal of Applied Physics* 125, 194102, 2019.

## Preprints and Recent Workshops

- [1] Symmetry in Neural Network Parameter Spaces.  
**Bo Zhao**, Robin Walters, Rose Yu.  
*ArXiv preprint arXiv:2506.13018*
- [2] Emergence of Hierarchical Emotion Organization in Large Language Models  
**Bo Zhao\***, Maya Okawa\*, Eric J. Bigelow, Rose Yu, Tomer Ullman, Hidenori Tanaka.  
*ArXiv preprint arXiv:2507.10599*
- [3] Data-Free Transformer Quantization Using Parameter-Space Symmetry.  
Lucas Laird, **Bo Zhao**, Rose Yu, Robin Walters  
*Workshop on High-dimensional Learning Dynamics (HiLD)* at ICML 2025.
- [4] Improving Learning to Optimize Using Parameter Symmetries.  
Guy Zamir, Aryan Dokania, **Bo Zhao**, Rose Yu  
*Workshop on Neural Network Weights as a New Data Modality* at ICLR 2025.

- [5] Finding Symmetry in Neural Network Parameter Spaces.  
**Bo Zhao**, Nima Dehmamy, Robin Walters, Rose Yu.  
*Workshop on Unifying Representations in Neural Models at NeurIPS 2024.*

## SELECTED TALKS

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Understanding Mode Connectivity via Parameter Space Symmetry · <i>ELLIS Reading Group on Mathematics of Deep Learning</i>	June 2025
Symmetries in the Parameter Space of Neural Networks · <i>Northeastern University, Geometric Learning Lab</i> · <i>Technion, Professor Haggai Maron's group</i>	June 2024 Feb 2024
Symmetries, Flat Minima, and the Conserved Quantities of Gradient Flow · <i>Southern California Applied Mathematics Symposium</i> (contributed talk) · <i>Boston Computation Club</i>	April 2024 July 2023
Symmetry Teleportation for Accelerated Optimization · <i>Conference on the Mathematical Theory of Deep Learning</i> (contributed talk)	Nov 2022
LIMO: Latent Inceptionism for Targeted Molecule Generation · <i>ICML 2022</i> (spotlight)	July 2022

## TEACHING

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<b>Teaching Assistant</b> , CS 291A Generative AI, UC San Diego	Fall 2025
<b>Teaching Assistant</b> , CS 4641 Machine Learning, Georgia Tech	Fall 2020
<b>Lead Course Assistant</b> , CS 225 Data Structures, UIUC	Spring 2019
<b>Course Assistant</b> , CS 225 Data Structures, UIUC	Fall 2017, Spring 2018, Fall 2018

## SERVICE

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### Workshop organization

Organizer, NeurIPS Workshop on Unifying Representations in Neural Models (UniReps), 2025  
 Organizer, ICLR Workshop on Neural Network Weights as a New Data Modality, 2025  
 Student Program and Funding Chair, WiML Workshop at NeurIPS, 2024

### Reviewer

ICML (2022-2025), NeurIPS (2022-2025), ICLR (2024-2025), AISTATS (2024-2025), AAAI (2025-2026), TMLR (2024-2025)