# ZIHUI (RAY) WU

Curriculum Vitae (March 2025)

zwu2@caltech.edu ⋄ zihuiwu.github.io

## EDUCATION

**California Institute of Technology (Caltech)** <span style="float:right">Pasadena, CA</span>
*Ph.D. candidate* in Computing & Mathematical Sciences <span style="float:right">Sep. 2020 — now</span>
Research advisor: Katherine L. Bouman
Cummulative GPA: 4.0/4.0

**Washington University in St. Louis (WUSTL)** <span style="float:right">St. Louis, MO</span>
*Bachelor of Science* in Computer Science <span style="float:right">Aug. 2016 — May 2020</span>
Second major: Mathematics
Research advisor: Ulugbek S. Kamilov
Cummulative GPA: 3.98/4.0

## RESEARCH INTERESTS

My research interests lie at the intersection of computational imaging, optimization, and machine learning. Recently, I have been working on developing efficient Markov chain Monte Carlo (MCMC) algorithms for posterior sampling and uncertainty quantification (UQ) in imaging inverse problems. My previous research focused on designing machine learning algorithms for the full-pipeline optimization of biomedical imaging applications, such as the magnetic resonance imaging (MRI).

## PUBLICATIONS

(* indicates co-first authors.)

12. B. Zhang*, **Z. Wu\***, B. Feng, Y. Yue, and K. L. Bouman, "STℰP: A General and Scalable Framework for Solving Video Inverse Problems with Spatiotemporal Diffusion Priors," *in submission*, 2025.

11. H. Zheng*, W. Chu*, B. Zhang*, **Z. Wu\***, A. Wang, B. Feng, C. Zou, Y. Sun, N. Kovachki, Z. Ross, K. L. Bouman, and Y. Yue, "InverseBench: Benchmarking Plug-and-Play Diffusion Models for Scientific Inverse Problems," *International Conference on Learning Representations (ICLR)*, 2025. (**Spotlight**)

10. A. S. Jatyani, J. Wang, A. Chandrashekar, **Z. Wu**, M. Liu-Schiaffini, B. Tolooshams, A. Anandkumar, "A Unified Model for Compressed Sensing MRI Across Undersampling Patterns," *Conference on Computer Vision and Pattern Recognition (CVPR)*, 2025.

9. **Z. Wu**, Y. Sun, Y. Chen, B. Zhang, Y. Yue, and K. L. Bouman, "Principled Bayesian Imaging using Diffusion Models as Plug-and-Play Priors," *Neural Information Processing Systems (NeurIPS)*, 2024.

8. Y. Sun, **Z. Wu**, Y. Chen, B. T. Feng, and K. L. Bouman, "Provable Probabilistic Imaging using Score-Based Generative Priors," *IEEE Transactions on Computational Imaging (TCI)*, 2024.

7. **Z. Wu**, T. Yin, Y. Sun, R. Frost, A. van der Kouwe, A. V. Dalca, and K. L. Bouman, "Learning Task-Specific Strategies for Accelerated MRI," *IEEE Transactions on Computational Imaging (TCI)*, 2024.

6. X. Wu, A. Ajorlou, **Z. Wu**, A. Jadbabaie, "Demystifying Oversmoothing in Attention-Based Graph Neural Networks," *Neural Information Processing Systems (NeurIPS)*, 2023. (**Spotlight**)

5. **Z. Wu\***, T. Yin*, A. V. Dalca, and K. L. Bouman, "Region-of-Interest Adaptive Acquisition for Accelerated MRI," *NeurIPS 2022 Medical Imaging Meets NeurIPS workshop*, 2022.

4. T. Yin*, **Z. Wu\***, H. Sun, A. V. Dalca, Y. Yue, and K. L. Bouman, "End-to-End Sequential Sampling and Reconstruction for MR Imaging," *Proceedings of Machine Learning for Health (ML4H)*, PMLR 158:261-281, 2021. (**Best Paper Award**)

3. Y. Sun*, **Z. Wu\***, X. Xu*, B. Wohlberg, and U. S. Kamilov, "Scalable Plug-and-Play ADMM with Convergence Guarantees," *IEEE Transactions on Computational Imaging (TCI)*, vol. 7, pp. 849-863, 2021.

2. **Z. Wu**, Y. Sun, A. Matlock, J. Liu, L. Tian, and U. S. Kamilov, "SIMBA: Scalable Inversion in Optical Tomography Using Deep Denoising Priors," *IEEE Journal of Selected Topics in Signal Processing (JSTSP)*, vol. 14, no. 6, pp. 1163-1175, Oct. 2020, doi: 10.1109/JSTSP.2020.2999820.

1. **Z. Wu**, Y. Sun, J. Liu, and U. S. Kamilov, "Online Regularization by Denoising with Applications to Phase Retrieval," *Proceedings of the IEEE International Conference on Computer Vision Workshop (ICCVW)*, 2019. (**Oral presentation**)

## HONORS

- *Amazon AI4Science Fellowship*                                                                     2023
- *Best Paper Award*, Machine Learning for Health (ML4H) 2021                                         2021
- *Kortschak Scholars Graduate Fellowship*, Caltech                                          2020 — 2022
- *Dean's List*, WUSTL                                                                       All semesters
- Selected member of Engineering's Mentor Collective program, WUSTL                            2018, 2019
- *Certificate of Distinction*, American Mathematics Competitions                                     2015

## SKILLS

*Programming languages*
- Advanced: Python, MATLAB
- Intermediate: C++, Java, R

*Python packages*
- `pytorch`, `tensorflow`, `numpy`, `pandas`, `scipy`, `sklearn`, `networkx`

## SELECTED COURSES

- Mathematics classes:
  - Mathematical Optimization                                                                   Grade: A+
  - Stochastic Processes and Regression                                                         Grade: A+
  - Linear Analysis with Applications                                                            Grade: A
  - Mathematics of Signal Processing                                                             Grade: A
  - Monte Carlo Methods for Scientific Computing                                                 Grade: A
- Computer and computational science classes:
  - Machine Learning & Data Mining                                                               Grade: A+
  - Advanced Topics in Machine Learning                                                          Grade: A
  - Analysis and Design of Algorithms                                                            Grade: A

## INVITED TALKS

- EI Conference on Machine Learning for Scientific Imaging                              Jan. 2020, Online
  - Title: *End-to-End Sequential Sampling and Reconstruction for MR Imaging*
- Learning group presentation, LCN, Martinos Center, MGH, HMC                           Oct. 2022, Online
  - Title: *Learning Task-Specific Strategies for Accelerated MRI*

## PROFESSIONAL SERVICE

**Journal:**
- IEEE Transactions on Computational Imaging, *reviewer*                                   since Jul. 2022
- IEEE Transactions on Robotics and Automation Letters, *reviewer*                         since Jul. 2023
- IEEE Transactions on Image Processing, *reviewer*                                        since Feb. 2024
- IEEE Transactions on Pattern Analysis and Machine Intelligence, *reviewer*               since Feb. 2024

**Conference:**
- IEEE International Symposium on Biomedical Imaging (ISBI), *reviewer*                                2023
- Pacific Symposium on Biocomputing, *reviewer*                                                       2023
- The Conference on Computer Vision and Pattern Recognition, *reviewer*                               2024

**Workshop:**

- NeurIPS 2023 Workshop on Deep Generative Models for Health, *reviewer* 2023

## TEACHING

- TA for *CS 101: Special Topics in Computer Science*, Caltech Fall 2022
- TA for *EE 148: Large Language and Vision Models*, Caltech Spring 2023

## RESEARCH AND WORK EXPERIENCE

- *Quantitative Research Intern*, Jump Trading
  Jun. 2024 — Aug. 2024 Chicago, IL; New York, NY

- *Research Assistant*, A.A. Martinos Center for Biomedical Imaging, MGH, Harvard Medical School
  Jun. 2022 — Sep. 2022; Aug. 2023 — Sep. 2023 Charlestown, MA
    - Research Assistant with Prof. Adrian V. Dalca, Robert Frost, and Andre van der Kouwe.
    - **Scanner-level** compressed sensing MRI sequence programming

- *Research Assistant*, Caltech
  Sep. 2020 — present Pasadena, CA
    - Graduate Research Assistant with Prof. Katherine L. Bouman.

- *Research Assistant*, WUSTL
  Sep. 2018 — Jun. 2020 St. Louis, MO
    - Undergraduate Research Assistant with Prof. Ulugbek S. Kamilov.

- *Research Assistant*, WUSTL
  Feb. 2018 — Sep. 2018 St. Louis, MO
    - Undergraduate Research Assistant with Prof. William Yeoh.

- *Website Developer*, Beijing Hengxinqihua Information Technology Co., Ltd.
  May 2017 — Jul. 2017 Beijing, China

- *Research Assistant*, Institute of Computing Technology, Chinese Academy of Sciences
  Sep. 2015 — Nov. 2015 Beijing, China
    - Research assistant for the project "Video-based Object Tracking and Recognition."