ZIHUI (RAY) WU

Curriculum Vitae (April 2025)
zwu2@caltech.edu ⋄ zihuiwu.github.io

EDUCATION

California Institute of Technology (Caltech) — Pasadena, CA
Ph.D. candidate in Computing & Mathematical Sciences — Sep. 2020 — now
Research advisor: Katherine L. Bouman
Cummulative GPA: 4.0/4.0

Washington University in St. Louis (WUSTL) — St. Louis, MO
Bachelor of Science in Computer Science — Aug. 2016 — May 2020
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.)

13. B. Zhang*, **Z. Wu***, B. Feng, Y. Yue, and K. L. Bouman, "STεP: A General and Scalable Framework for Solving Video Inverse Problems with Spatiotemporal Diffusion Priors," *in submission*, 2025.
12. A. Wang, H. Zheng, **Z. Wu**, R. Baptista, D. Z. Huang, and Y. Yue, "Ensemble Kalman Sampling and Diffusion Prior in Tandem: A Split Gibbs Framework," *International Conference on Learning Representations Frontiers in Probabilistic Inference (FPI) Workshop*, 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

- *Thomas A. Tisch Prize for Graduate Teaching in CMS*, Caltech 2024
- *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
- SIAM Journal on Scientific Computing, *reviewer* since Mar. 2025

- SIAM Journal on Imaging Sciences, *reviewer* since Apr. 2025

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."