

# ZIHUI (RAY) WU

Curriculum Vitae (December 2024)

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## EDUCATION

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### California Institute of Technology (Caltech)

*Ph.D. candidate* in Computing & Mathematical Sciences

Research advisor: Katherine L. Bouman

Cummulative GPA: 4.0/4.0

Pasadena, CA

Sep. 2020 — now

### Washington University in St. Louis (WUSTL)

*Bachelor of Science* in Computer Science

Second major: Mathematics

Research advisor: Ulugbek S. Kamilov

Cummulative GPA: 3.98/4.0

St. Louis, MO

Aug. 2016 — May 2020

## RESEARCH INTERESTS

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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

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(\* indicates co-first authors.)

10. 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,” in submission.
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)*, in press.
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

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- *Amazon AI4Science Fellowship* 2023
- *Best Paper Award*, Machine Learning for Health (ML4H) 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

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### *Programming languages*

- Advanced: Python, MATLAB
- Intermediate: C++, Java, R

### *Python packages*

- pytorch, tensorflow, numpy, pandas, scipy, sklearn, networkx

## SELECTED COURSES

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- 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

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- 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

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### **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

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

Fall 2022  
Spring 2023

## RESEARCH AND WORK EXPERIENCE

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- *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.”