ZIHUI (RAY) WU

Curriculum Vitae (August 2023)

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EDUCATION

California Institute of Technology (Caltech)   Pasadena, CA
Ph.D. candidate in Computing & Mathematical Sciences   Sep. 2020 — May 2025 (expected)
Research advisor: Katherine L. Bouman

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

RESEARCH INTERESTS

My research interests lie at the intersection of computational imaging, optimization, and machine learning. The theoretical aspect of my research focuses on efficient Markov chain Monte Carlo (MCMC) algorithms for posterior sampling and uncertainty quantification (UQ). The application-oriented part of my research focuses designing machine learning algorithms for the full-pipeline optimization of biomedical imaging applications, such as the magnetic resonance imaging (MRI). My research has enabled me to have strong skills in both quantitative analysis and practical implementation.

PUBLICATIONS

(* indicates co-first authors.)

7. X. Wu, A. Ajorlou, **Z. Wu**, A. Jadbabaie, A. V. Dalca, and K. L. Bouman, "Demystifying Oversmoothing in Attention-Based Graph Neural Networks," *arXiv:2305.16102*, 2023.

6. **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)*, under review.

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**

SELECTED COURSES

- Mathematics classes:
  - Probability Theory and Stochastic Processes   Grade: A-
  - Linear Analysis with Applications   Grade: A
  - Mathematics of Signal Processing   Grade: A

- – Mathematical Optimization   Grade: A+
- – Stochastic Processes and Regression   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*

PROFESSIONAL SERVICE

Journal:

- IEEE Transactions on Computational Imaging, *reviewer*   since Jul. 2022
- IEEE Transactions on Robotics and Automation Letters, *reviewer*   since Jul. 2023

Conference:

- IEEE International Symposium on Biomedical Imaging (ISBI), *reviewer*   2023
- Pacific Symposium on Biocomputing, *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

- *Research Assistant*, A.A. Martinos Center for Biomedical Imaging, MGH, Harvard Medical School
  Aug. 2023 — present   Charlestown, MA
  - – Research Assistant with Prof. Adrian V. Dalca, Robert Frost, and Andre van der Kouwe.
- *Research Assistant*, A.A. Martinos Center for Biomedical Imaging, MGH, Harvard Medical School
  Jun. 2022 — Sep. 2022   Charlestown, MA
  - – Research Assistant with Prof. Adrian V. Dalca, Robert Frost, and Andre van der Kouwe.
- *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

    – Worked as a research assistant for the project "Video-based Object Tracking and Recognition."

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