

Yongyi Zhao

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Introduction: My research is in computational imaging and machine learning for end-to-end hardware and algorithm co-design. I have worked on several projects spanning data-driven biomedical optical imaging, neural rendering, polarimetric imaging, metasurface design, and AI mobile processing. My research has been published in top tier journals (Optica, TPAMI) and conferences (ECCV, ICCP). I am fluent in scripting languages (Python, Matlab), machine learning frameworks (Pytorch), and experienced with system-level languages (C/C++, Cuda), and rendering/3D design software (Blender, Solidworks, Mitsuba).

Education

Rice University	Houston, TX
Doctor of Philosophy in Electrical and Computer Engineering	Jan 2024
Master of Science in Electrical and Computer Engineering	Mar 2021
Adviser: Professor Ashok Veeraraghavan	

Carnegie Mellon University	Pittsburgh, PA
Bachelor of Science in Electrical and Computer Engineering	Dec 2017
With University Honors; GPA: 3.93/4.00	

Professional Experience

Computer Vision Engineer at Metalenz	Boston, MA (remote)
❖ Developing algorithms for PolarID: secure face ID authentication	Feb 2024 – Present

Research intern at Samsung Research America	Plano, TX
❖ Worked in Mobile Processor Innovations (MPI) team	May 2023 – Aug 2023
❖ Developed AI algorithm for mobile image processing	

Software Development Engineer Intern at Amazon.com	Seattle, WA
❖ Worked on Amazon AWS, Elastic Compute Cloud Team	May 2017 – Aug 2017
❖ Designed and implemented a container service	

Research Projects

Metalens for Privacy Preserving Imaging	Jan 2023 – Jan 2024
❖ Designed/implemented a differentiable metalens simulator for end-to-end optimization in privacy-preservation	

Optically Asymmetric Plume Design	Sep 2022 – Jan 2024
❖ Developed a differentiable renderer for end-to-end optimization of asymmetric plumes (a plume that selectively degrades image quality based on viewing direction), using implicit neural representations	
❖ Tested results on both simulated (rendered) and experimental measurements in VIS and IR	

Computational Imaging through Dense Scatterers (Links to JBO and TPAMI papers)	Aug 2019 – Mar 2023
❖ Implemented FISTA/ADMM solvers in Matlab and unrolled neural network in Pytorch for DOT inverse solver	
❖ Demonstrated high resolution image reconstruction on simulated/experimental CW/ToF-DOT datasets	
❖ Simulated light propagation and Jacobian matrix for arbitrary scattering media, parallelized in Cuda (Code link)	

Neural Renderer for Polarimetric Imaging (Link to ECCV paper)	Oct 2021 – Mar 2022
❖ Designed and implemented polarimetric neural rendering pipeline using implicit neural representations	
❖ Demonstrated performance on inverse rendering tasks (i.e. diffuse-specular separation) on experimental data	

Publications

Peer reviewed journal and conference papers

- [10] Raghuram A., **Zhao Y.*** “GDOT: Time-Gated Diffuse Optical Tomography.” *Journal of Biomedical Optics*. In preparation.
- [9] Tasneem Z., **Zhao Y.**, et al. “Privacy-aware Meta-Optics for Person Detection.” *ACS Photonics*. Under Review.
- [8] Guo Z., **Zhao Y.**, “Noninvasive monitoring of fetal tissue oxygenation level using time-domain NIRS.” *Journal of Biomedical Optics*. (2025).
- [7] **Zhao Y.***, Farrell S.*, et al. “SCREEN: SCatteREr ENabled optical asymmetry.” *Optica*. (2025).
- [6] Guo Z., Yang Y., **Zhao Y.**, et al. “High spatial resolution diffuse optical tomography with directional information.” *Optics Letters*. (2025).
- [5] Wang F., Kim H. K., **Zhao Y.**, et al. “High-Speed Time-Domain Diffuse Optical Tomography With a Sensitivity Equation-Based Neural Network.” *IEEE Transactions on Computational Imaging*. (2023).
- [4] **Zhao Y.**, Raghuram A., et al. “Unrolled-DOT: An Interpretable Deep Network for Diffuse Optical Tomography.” *Journal of Biomedical Optics*. (2023).
- [3] Dave A., **Zhao Y.**, Veeraraghavan A. "PANDORA: Polarization-Aided Neural Decomposition Of Radiance." *European Conference on Computer Vision (ECCV)*. (2022).
- [2] Kim H. K., **Zhao Y.**, et al. Ultrafast and Ultrahigh-Resolution Diffuse Optical Tomography for Brain Imaging with Sensitivity Equation based Noniterative Sparse Optical Reconstruction (SENSOR). *JQSRT*. (2021).
- [1] **Zhao Y.***, Raghuram A. *, et al. “High Resolution, Deep Imaging Using Confocal Time-of-flight Diffuse Optical Tomography.” *IEEE Transactions on Pattern Analysis and Machine Intelligence*. (2021).

*Indicates authors contributed equally

Patents

- [1] **Zhao Y.**, Raghuram A., et al. “GDOT: Gated Diffuse Optical Tomography,” US20230233085A1. Patent Pending.

Book chapters

- [1] Raghuram A., **Zhao Y.**, et al. “Measuring Physiological Parameters Under the Skin Using Visible/NIR Light.” *Encyclopedia of Sensors and Biosensors 4*, pp. 133-142. (2023) Book Chapter.

Posters and presentations

- [2] Kim H. K., Raghuram A., **Zhao Y.** et al. “Ultrahigh spatiotemporal resolution fluorescence molecular tomography with a sparsity constrained dimensional reduction reconstruction model.” *High-Speed Biomedical Imaging and Spectroscopy VII*. (2022). Poster.
- [1] **Zhao Y.** “Real-time Algorithms for Non-Invasive Imaging Through the Skull.” *NLM Informatics Research Training Conference*. 2021. Oral Presentation.

Fellowships and Awards

National Library of Medicine Fellowship in Bioinformatics and Data Science

Jan 2021 – Dec 2022

❖ 2-year fellowship with \$25,320 stipend and partial tuition support

Best Paper Runner-Up at IEEE ICCP for Confocal ToF-DOT paper

May 2021

John Clark Jr. Fellowship Award

Aug 2018

- ❖ Fellowship supporting first-year graduate studies at Rice University

Frank J. Marshall Scholar Award

May 2018

- ❖ Annual award for one graduating CMU ECE undergraduate for academics and research

Skills

Programming/Computing:

- ❖ **Strong:** Python (including PyTorch, OpenCV, Numpy libraries), Matlab
- ❖ **Proficient:** C/C++, Cuda, Linux, Blender, Rapid prototyping (SLA and FDM 3D printing)
- ❖ **Working understanding:** Version Control (Git), SolidWorks, Mitsuba (physics-based renderer), Laser cutting

Experimental:

- ❖ Optical system design (i.e. constructing scanning and fiber-based time domain diffuse optical imaging system)
- ❖ Imaging on model organisms (e.g. mice, sheep)

Volunteer / Service

Teaching Assistant (TA)

- ❖ Served as an ECE TA for 9 semesters (3 during undergraduate; 6 during PhD); courses included: signal processing, computer architecture, digital logic design, introductory programming, and deep learning
- ❖ Performed TA tasks including teaching recitations, special topic lectures, grading, and office hours

Research Mentor

- ❖ Mentored 3 Rice University undergraduate students (for 7 semesters total) in computational imaging research
- ❖ Mentored six middle and high school teachers in Houston ISD for PATHS-UP RET program (Summer 2019)