

# 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**

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### **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**

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**National Library of Medicine Fellowship in Bioinformatics and Data Science**

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

**Jan 2021 – Dec 2022**

<b>Best Paper Runner-Up at IEEE ICCP for Confocal ToF-DOT paper</b>	<b>May 2021</b>
<b>John Clark Jr. Fellowship Award</b>	<b>Aug 2018</b>
❖ Fellowship supporting first-year graduate studies at Rice University	
<b>Frank J. Marshall Scholar Award</b>	<b>May 2018</b>
❖ Annual award for one graduating CMU ECE undergraduate for academics and research	

## **Skills**

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### **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**

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### **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)