Luzhe Huang

Phone: +1-424-402-2604 **Email:** lzhuang0324@ucla.edu
LinkedIn: /luzhe-huang **GitHub:** /PORPHURA **Page:** /porphura.github.io

Summary

- Proficient in designing and implementing cutting-edge **machine learning** and **AI** solutions, especially for a spectrum of **imaging and vision** challenges, including image processing, enhancement, restoration, and segmentation
- 7 years of dedicated research in the realm of **computational imaging**, specializing in **computational microscopy**, with a focus on solving intricate **inverse problems** across diverse imaging modalities
- **18** research articles published on peer-reviewed journals, accumulating more than **500** citations

Education

University of California, Los Angeles | Ph.D., Electrical and Computer Engineering   Sep 2019 - Oct 2024
- GPA: 3.96/4
- Received UCLA **Dissertation Year Fellowship** and **Amazon Fellowship**

Zhejiang University | BEng, Optical Science and Engineering, Statistics   Sep 2015 - Jun 2019
- GPA: 3.96/4
- Received **National Scholarship** twice and Zhejiang University **Special Scholarship**

Projects (Selected)

Multi-scale conditonal generative model   Sep 2023 - Oct 2024
- Developed a image pyramid generative model in multi-scale wavelet domain for **image restoration** tasks
- Systematically integrated **diffusion model** and **GAN** for the generation of multi-scale wavelet components

Self-supervised learning based on physical laws and thought experiments (GedankenNet)   Feb 2022 - Aug 2023
- Developed a novel **self-supervised** neural network using **physics-informed learning** and **pure artificial data** (thought experiments), showing superior performance and generalization than supervised models
- Addressed the reliance of supervised learning on large-scale, high-quality labels and their limited generalization
- **Synergistically designed** generalizable optical system and backend image processing model

Cycle-consistency uncertainty quantification of neural networks on inverse problems   Dec 2022 - Oct 2023
- Built novel **uncertainty quantification** for neural networks on inverse problems using forward-backward cycles
- Developed machine learning algorithms to detect **corrupted** and **out-of-distribution** data based on cycle consistency
- Developed **autonomous quality and hallucination monitor** for neural networks

Fourier Imager Network with superior external generalization (FIN)   Aug 2021 - Apr 2022
- Developed FIN, a novel neural network utilizing **global spatial-frequency** information in spatial and Fourier domains, showing superior **external generalization** on unseen distributions
- Enhanced FIN with dynamic network modules (eFIN), showcasing its versatility in multiple image restoration tasks

Recurrent neural network (RNN)-based high-dimensional imaging   Jun 2020 - Jul 2022
- Developed a RNN-based **high-dimensional image reconstruction** approach using sparse sequential low-dimensional measurements, and validated it on various high-dimensional microscopy image reconstruction tasks

Single-shot autofocusing of microscopy image using deep learning (Deep-R)   Sep 2019 - Jan 2021
- Developed Deep-R for **offline autofocusing** of microscopy images without the prior knowledge or measurement of the system point spread function (PSF)

Career Experience

TikTok   San Jose, USA
Machine Learning Researcher   Oct 2024 - Present

Autowise.ai   Shanghai, China
Software R&D Engineer Intern   Feb 2019 - Jun 2019
- Implement **3D point cloud**-based **object detection and segmentation** algorithms for autonomous driving
- Participate in establishing **LiDAR** calibration models under various weather conditions

Technical Skills

Programming	Python (PyTorch, Tensorflow, JAX), R, MATLAB
Frameworks & Tools	Zemax, Unity

Professional Service

- Served as reviewers for top journals including Nature Machine Intelligence, IEEE Transactions on Medical Imaging, Optics Express, Biomedical Optics Express, JOSA A, etc.
- Reviewed more than **20** research articles.
- Mentored more than **10** undergrad and master students and supervised them conducting research projects in UCLA.

PUBLICATIONS (SELECTED)

1. Y. Ma, J. Park, **L. Huang** et al. Light-field tomographic fluorescence lifetime imaging microscopy. *PNAS* 121.40, e2402556121 (2024)
2. M.J. Fanous, P. Casteleiro Costa, C. Isil, **L. Huang**, Neural network-based processing and reconstruction of compromised biophotonic image data. *Light: Science & Applications* 13, 231 (2024).
3. Y. Li, N. Pillar, J. Li, T. Liu, D. Wu, S. Sun, G. Ma, K. de Haan, **L. Huang** et al. "Virtual histological staining of unlabeled autopsy tissue." **Nature Communications** 15, 1684 (2024)
4. V.N. Astratov, Y.B. Sahel, Y.C. Eldar, **L. Huang**, A. Ozcan et al. "Roadmap on Label-Free Super-Resolution Imaging." *Laser & Photonics Reviews* 2200029 (2023)
5. J. Park, B. Bai, D. H. Ryu, T. Liu, C. Lee, Y. Luo, M. J. Lee, **L. Huang** et al. Artificial intelligence-enabled quantitative phase imaging methods for life sciences. **Nature Methods** 20, 1645-1660 (2023)
6. **L. Huang**, J. Li, X. Ding et al. Cycle-Consistency-Based Uncertainty Quantification of Neural Networks in Inverse Imaging Problems. *Intelligent Computing*. 2: 0071 (2023)
7. **L. Huang**, H. Chen, et al. Self-supervised learning of hologram reconstruction using physics consistency. **Nature Machine Intelligence** 5, 895-907 (2023)
8. H. Chen, **L. Huang** et al. eFIN: Enhanced Fourier Imager Network for Generalizable Autofocusing and Pixel Super-Resolution in Holographic Imaging. *IEEE JSTQE*, 29, 4, 1-10 (2023)
9. H. Chen, **L. Huang** et al. Fourier Imager Network (FIN): A deep neural network for hologram reconstruction with superior external generalization. *Light: Science & Applications* 11, 254 (2022)
10. **L. Huang**, T. Liu, et al. Holographic image reconstruction with phase recovery and autofocusing using recurrent neural networks. *ACS Photonics* 8, 6, 1763-1774 (2021)
11. **L. Huang**, H. Chen, Y. Luo, et al. Recurrent neural network-based volumetric fluorescence microscopy. *Light: Science & Applications* 10, 62 (2021)
12. Y. Luo, **L. Huang**, Y. Rivenson, A. Ozcan, Single-shot autofocusing of microscopy images using deep learning. *ACS Photonics*, 8, 2, 625-638 (2021)
13. **L. Huang**, Y. Fu, R. Chen, et al. SNR-adaptive OCT angiography enabled by statistical characterization of intensity and decorrelation based on multi-variate time series model. **IEEE Transactions on Medical Imaging**, 38, 11, 2695-2704 (2019)
14. **L. Huang**, X. Wang, Y. Yuan, S. Gu, Y. Shen, An improved algorithm of NLOS imaging based on Bayesian statistics. *JOSA.A* 36, 5, 834-838 (2019)
15. **L. Huang**, T. Fang, Q. Shuai, Calibration and imaging of a CT system, *Chinese Journal of Engineering Mathematics.* 34, 1 (2017)

CONFERENCE PUBLICATIONS (SELECTED)

1. **L. Huang**, H. Chen, T. Liu, and A. Ozcan, "Self-supervised, physics-informed learning for hologram reconstruction" in SPIE Photonics West 2024 (AI/ML **Best Paper**)
2. **L. Huang**, H. Chen, T. Liu, and A. Ozcan, "Self-supervised neural network for holographic microscopy (invited)," in Conference on Lasers and Electro-Optics, Technical Digest Series, Technical Digest Series (Optica Publishing Group, 2023), paper ATu3Q.4
3. **L. Huang**, X. Yang, T. Liu, A. Ozcan, "Few-shot generalizable hologram reconstruction model using a recurrent neural network (RNN) (Conference Presentation)," Proc. SPIE PC12204, Emerging Topics in Artificial Intelligence (ETAI) 2022, PC122040H (4 October 2022)
4. **L. Huang**, T. Liu, X. Yang, Y. Luo, Y. Rivenson, and A. Ozcan, "Phase Recovery and Holographic Imaging using Recurrent Neural Networks (RNNs)," in Conference on Lasers and Electro-Optics, Technical Digest Series (Optica Publishing Group, 2022), paper ATh1D.5
5. **L. Huang**, T. Liu, X. Yang, Y. Luo, Y. Rivenson, A. Ozcan, "Holographic image reconstruction with phase recovery and autofocusing using recurrent neural networks," Proc. SPIE 11970, Quantitative Phase Imaging VIII, 119700C (2 March 2022)

ACHIEVEMENTS & AWARDS

- UCLA Dissertation Year Fellowship
- Amazon Doctoral Student Fellowship
- UCLA ECE Department Fellowship
- Zhejiang University Special Scholarship (Supreme award for Undergraduates)
- Zhejiang University Chu Kochen College Innovation Scholarship
- National Scholarship ($\times 2$)
- MATLAB Innovation Prize (Special Prize) in China Undergraduate Mathematical Contest in Modeling