HAOWEN ZHOU

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EDUCATION

California Institute of Technology — Pasadena CA, USA
Ph.D. in Electrical Engineering — Sept 2021 – Expected June 2026
M.S. in Electrical Engineering — Sept 2021 – June 2024

- Schmidt GRA Fellow | Naren and Vinita Gupta Fellow | SPIE Optics and Photonics Scholarship
- Advised by Prof. Changhuei Yang

University of Dayton — Dayton OH, USA
M.S. in Electro-Optics and Photonics — Aug 2019 – May 2021

- Dean's Fellow
- Advised by Prof. Partha Banerjee

Huazhong University of Science and Technology — Wuhan, China
B.E. in Optoelectronics — Aug 2015 – June 2019

- Outstanding Undergraduate Thesis Award
- Advised by Prof. Wenxi Liang and Prof. Partha Banerjee

SELECTED AWARDS

Jakob van Zyl Predoctoral Research Award 2026
- Financial support and research grant for career development
- Electrical Engineering at California Institute of Technology

Schmidt Graduate Research Fellowship 2025
- Two-thirds of a full calendar year financial support
- Schmidt Academy for Software Engineering at California Institute of Technology

SPIE Optics and Photonics Scholarship 2024
- For long-term contributions to the optics and photonics community
- Society of Photographic Instrumentation Engineering (SPIE)

Naren and Vinita Gupta Sensing to Intelligence Fellowship 2021-2023
- Inaugural cohort of Naren and Vinita Gupta Fellow with two-year financial support
- California Institute of Technology

Dean's Fellowship 2019-2021
- Top in class with two-year financial support
- School of Engineering | University of Dayton

Outstanding Undergraduate Thesis Award 2019
- Top 2 in the class
- School of Engineering Sciences | Huazhong University of Science and Technology

National Endeavor Fellowship 2016-2017
- One-year tuition coverage
- Huazhong University of Science and Technology, China

Freshman Scholarship 2016

- Top 10% in the class
- School of Engineering Sciences | Huazhong University of Science and Technology

PUBLICATIONS

Patents [Names in no particular order]

1. [Provisional] H. Zhou, S. Zhao, C. Yang, "Digital defocus aberration interference for automated optical microscopy." CIT-9339-P (2025).
2. [Provisional] Z. Dong, H. Zhou, R. Cao, C. Yang, "Analytic Fourier ptychotomography for volumetric refractive index imaging." CIT-9298-P (2025)
3. H. Zhou, S. Lin, C. Yang, R. Cote, M. Watson, G. Ramaswamy, "Codesign of stain-free all-in focus imaging with deep learning" US Patent, US63/641,581 (2025)
4. H. Zhou, C. Yang, "Deep neural networks for outcome-oriented predictions." US Patent, US18/638,327 (2024).

ArXiv Papers / Paper in Review [* indicates equal contribution]

1. H. Zhou*, S. Zhao*, Y. Fan, Z. Dong, O. Zhang, V. Gradinaru, and C. Yang, "Digital defocus aberration correction for automated optical microscopy." arXiv, https://arxiv.org/abs/2507.10867 (2025).
2. S. Mahler*, A. Arora*, C. Readhead*, S. Yin*, S. N. Hari, E. Wang, C. I. Moxley, A. A. Adeboye, Z. Dong, H. Zhou, X. Chen, M. Bronner, and C. Yang, "Exploring non-invasive sexing of early chick embryos in intact eggs using Laser Speckle Contrast Imaging (LSCI) and Deep Neural Network (DNN)," bioRxiv, https://doi.org/10.1101/2025.04.17.649355 (2025).

Peer-Reviewed Publications

3. Z. Dong*, H. Zhou*, R. Cao*, O. Zhang, S. Zhao, P. Lyu, R. Alcalde, and C. Yang, "Analytic Fourier ptychotomography for aberration-free and high-resolution volumetric refractive index imaging," Nat. Commun. (2025).
4. S. Zhao, H. Zhou, and C. Yang, "Hybrid-illumination multiplexed Fourier ptychographic microscopy with robust aberration correction," J. Phys. Photonics 8 015009 (2025).
5. R. He, H. Zhou, Y. Chen, and Y. Xue, "Recover biological structure from sparse-view diffraction images with neural volumetric prior." International Conference on Computer Vision (ICCV) (2025).
6. S. Lin, H. Zhou, R. Cao, S. Zhao, O. Zhang, and C. Yang, "Dome-APIC illumination design for high space-bandwidth product analytic imaging," Biomed. Opt. Express, 16, 1666-1677 (2025).
7. O. Zhang*, H. Zhou*, B. Y. Feng, E. M. Larsson, R. E. Alcalde, S. Yin, C. Deng, and C. Yang, "Single-shot volumetric fluorescence imaging with neural fields," Adv. Photonics, 7, 026001 (2025).
8. S. Lin, H. Zhou, M. Watson, R. Govindan, R. J. Cote, and C. Yang, "Impact of Stain Variation and Color Normalization for Prognostic Predictions in Pathology," Sci. Rep. 14 2369 (2025).
9. H. Zhou*, S. Lin*, M. Watson, C. T. Bernadt, O. Zhang, R. Govindan, R. J. Cote, and C. Yang, "Length-scale study in deep learning prediction for non-small cell lung cancer brain metastasis," Sci. Rep. 14 22328 (2024).
10. S. Zhao*, H. Zhou*, S. Lin, R. Cao, and C. Yang, "Efficient, gigapixel-scale, aberration-free whole slide scanner using angular ptychographic imaging with closed-form solution," Biomed. Opt. Express 15, 5739-5755 (2024).

11. O. Zhang*, R. E. Alcalde*, H. Zhou, S. Yin, D. K. Newman, and C. Yang, "Investigating 3D microbial community dynamics of the rhizosphere using quantitative phase and fluorescence microscopy," Proc. Natl. Acad. Sci. 121, e2403122121 (2024).

12. S. Yin, R. Cao, M. Liang, C. Shen, H. Zhou, O. Zhang, and C. Yang, "Can deep neural networks work with amplitude and phase input of defocused images?" Opt. Express 32, 25036-25045 (2024).

13. H. Zhou*, M. Watson*, C. T. Bernadt, S. Lin, C. Lin, J.H. Ritter, A. Wein, S. Mahler, S. Rawal, R. Govindan, C. Yang, and R. J. Cote, "AI-guided histopathology predicts brain metastasis in lung cancer patients," J. Pathol. 263, 89-98 (2024).

14. H. Zhou*, B. Y. Feng*, H. Guo, S. Lin, M. Liang, C. A. Metzler, and C. Yang, "FPM-INR: Fourier ptychographic microscopy image stack reconstruction using implicit neural representations," Optica 10, 1679-1687 (2023).

15. C. Shen, S. Rawal, R. Brown, H. Zhou, A. Agarwal, M. Watson, R.J. Cote, and C. Yang, "Automatic detection of circulating tumor cells and cancer associated fibroblasts using deep learning," Sci. Rep. 13, 5708 (2023).

16. H. Zhou, C. Shen, M. Liang, C. Yang, "Analysis of post-reconstruction digital refocusing in Fourier ptychographic microscopy," Opt. Eng. 61, 073102 (2022).

17. H. Zhou, M.M.R. Hussain, P. P. Banerjee, "A review of the dual-wavelength technique for phase imaging and 3D topography," Light Adv. Manuf. 3, 1-21 (2022).

18. H. Zhou, H. Guo, and P. P. Banerjee, "Non-recursive transport of intensity phase retrieval with the transport of phase," Appl. Opt. 61, B190-B199 (2022).

19. H. Guo, H. Zhou, and P. P. Banerjee, "Use of structured light in 3D reconstruction of transparent objects," Appl. Opt. 61, B214-B324 (2022).

20. H. Zhou, E. Stoykova, M. Hussain, and P. P. Banerjee, "Performance analysis of phase retrieval using transport of intensity with digital holography," Appl. Opt. 60, A73-A83 (2021).

21. H. Guo, H. Zhou, and P. P. Banerjee, "Single-shot digital phase-shifting Moiré patterns for 3D topography," Appl. Opt. 60, A84-A92 (2020).

22. H. Zhou, X. Sui, L. Cao, and P. P. Banerjee, "Digital correlation of computer-generated holograms for 3D face recognition," Appl. Opt. 58, G177-G186 (2019).

23. B. Bordbar, H. Zhou, and P. P. Banerjee, "3D object recognition through processing of 2D holograms," Appl. Opt. 58, G197-G203 (2019).

24. Q. Li, J. Wu, L. Huang, J. Gao, H. Zhou, Y. Shi, Q. Pan, G. Zhang, Y. Du, and W. Liang, "Sulfur dioxide gas-sensitive materials based on zeolitic imidazolate framework-derived carbon nanotubes," J. Mater. Chem. A. 6, 12115-12124 (2018).

Conference Proceedings / Abstracts

1. H. Zhou, B. Y. Feng, O. Zhang, H. Guo, S. Lin, M. Liang, S. Yin, C. Deng, C. A. Metzler, and C. Yang, "Neural fields in computational microscopy for biomedical applications," Computational Optical Sensing and Imaging, CTu3B.1 (2025).
2. M. A. Chan, H. Zhou, B. Y. Feng, and C. A. Metzler, "Sparse Color Fourier Ptychographic Microscopy with Implicit Neural Representations" Computational Optical Sensing and Imaging, CW3B. 5 (2024).

3. O. Zhang, R. E. Alcalde, H. Zhou, S. Yin, and C. Yang, "Complex-field and fluorescence microscopy using aperture scanning technique (CFAST) for studying rhizosphere organisms" Proc. SPIE, PC1284802 (2024).

4. C. Shen, H. Zhou, and C. Yang, "Non-interferometric and non-iterative complex wave-field reconstruction based on Kramers-Kronig relations," Proc. SPIE, 11970, 1197002 (2022).

5. H. Guo, H. Zhou, and P. P. Banerjee, "Surface shape reconstruction of transparent objects using structured light," DTh5C. 4, Digital Holography and 3D Imaging, OSA (2021).

6. H. Zhou and P. P. Banerjee, "Transport of intensity phase imaging with error correction using transport of phase equation," Proc. SPIE 11709, 117090D (2021).

7. H. Zhou, E. Stoykova, and P.P. Banerjee, "Phase retrieval using transport of intensity with off-axis digital holography for objects with large phase excursions", HF2D.5, Digital Holography and 3D Imaging, OSA (2020).

8. E. Stoykova, H. Zhou, and P.P. Banerjee, "Phase retrieval by transport of intensity in inline digital holography", HF2D.3, Digital Holography and 3D Imaging, OSA (2020).

9. H. Guo, H. Zhou, and P. P. Banerjee, "Single-shot Digital Phase-shifting Moiré Pattern for 3D Metallic Surface Imaging," HF3G.3, Digital Holography and 3D Imaging, OSA (2020).

10. H. Gao, H. Fang, J. Liu, H. Zhou, X. Cheng, S. Ding, J. Luo, S. Li, Z. Dai, and P.P. Banerjee, "A scanning method based on parabolic mirror and galvanometer for holographic contact copying," HTh4H.1, Digital Holography and 3D Imaging, OSA (2020).

11. H. Zhou, R. Hou, B. Bordbar, and P. P. Banerjee, "Effect of hologram windowing on correlation of 3D objects," Th2B.8, Digital Holography and 3D Imaging, OSA (2019).

12. H. Zhou, R. Hou, B. Bordbar, and P. P. Banerjee, "Effect of hologram size on 3D reconstruction using multi-wavelength digital holography," W4B.2, Digital Holography and 3D Imaging, OSA (2019).

13. P. P. Banerjee, U. Abeywickrema, H. Zhou, M. S. Alam, G. Nehmetallah, J. Khoury, and L. Cao, "Taking correlation from 2D to 3D: optical methods and performance evaluation," Proc. SPIE 10995, 10995-10 (2019).

14. H. Zhou, U. Abeywickrema, B. Bordbar, L. Cao, and P. P. Banerjee, "Correlation of holograms for surface characterization for diffuse objects," Proc. SPIE 10943, 10943-3 (2019).

PRESENTATIONS AND TALKS

1. "Digital defocus Aberration Interference for autofocusing and digital refocusing in microscopy" | SPIE Photonics West, San Francisco, 2026

2. **[Invited]** "Fourier ptychographic microscopy – recent advances and pressing challenges" | International Webinar on Image & Graphics Technologies, Chinese Society for Image and Graphics, Online, Nov. 5, 2025

3. "Fourier ptychographic microscopy – an introduction" | Schmidt Fellowship Science Seminar, Caltech, Oct. 14, 2025

4. "Neural fields in computational microscopy for biomedical applications" | Optica Imaging Congress, Seattle, Aug. 19, 2025

5. **[Invited]** "Physics-based computational microscopy to advance life science research" | Rice University, Prof. Ashok Veeraraghavan's Lab, Houston, July 29, 2025

6. **[Invited]** "Empowering microscopy with physics-based computation" | Electrical System Engineering Seminar Series at Washington University in St. Louis, June 4, 2025

7. **[Invited]** "Synergizing microscopy and computation to advance life science research" | Computer Vision Seminar Series at University of Maryland, College Park, Apr. 30, 2025

8. **[Invited]** "Empower computational microscopy with neural fields" | University of California - Berkeley, Prof. Na Ji's Lab Feb. Berkeley, 2025
9. "Single-shot 3D imaging with QuadraPol point spread function and neural fields" | SPIE Photonics West, San Francisco, 2025
10. **[Invited]** "Single-shot volumetric fluorescence imaging with neural fields" | SPIE Photonics West – Neurotechnology Plenary session, San Francisco, 2025
11. "Computational microscopy – algorithms driving better microscopes" | Academia-Industry X (AIX) seminar at California Institute of Technology, Pasadena, 2024
12. "Fourier ptychographic microscopy image stack reconstruction using implicit neural representations" | SPIE Photonics West, San Francisco, 2024
13. **[Invited]** "Improving pathology and life science research by leveraging computational microscopy and machine learning" | SPIE Photonics West, San Francisco, 2024
14. "Transport of intensity phase imaging with error correction using transport of phase equation" | SPIE Photonics West, Virtual, 2021
15. "Direct phase retrieval using digital holography with transport of intensity" | Power-Haus Seminar at University of Dayton, Ohio, 2020
16. "Correlation of holograms for surface characterization of diffuse objects" | SPIE Photonics West, San Francisco, 2019

PROFESSIONAL SERVICES

Journal Reviewer

- Nature Communications
- Light: Science and Applications
- Advanced Photonics
- IEEE Transactions on Medical Imaging
- Photonics Research
- Optics Letters
- Biomedical Optics Express
- IEEE Transactions on Computational Imaging
- Journal of the Optical Society of America A
- Optica
- Optics Express
- Applied Optics
- Optics Communication
- Nature Scientific Reports
- Advanced Imaging
- Optical Engineering
- Measurement
- Optics Continuum

Professional Societies

- Society of Photographic Instrumentation Engineering (SPIE) | Student Member 2018-Present
- Optica (formerly known as OSA) | Student Member 2018-Present
- IEEE Photonics Society | Student Member 2022

Professional Societies Services

- President of SPIE student chapter of University of Dayton 2020-2021
- President of Optica (formerly OSA) student chapter at University of Dayton 2020-2021

Technical Events

- The host of Power-Haus series seminars at University of Dayton 2021

TEACHING EXPERIENCE

Teaching Assistant

- Caltech EE151 Electromagnetic Engineering [Head TA] 2024 Spring
- Caltech EE151 Electromagnetic Engineering [Head TA] 2023 Spring

Lab Tutorial

- Lecture on phase imaging for new students at Caltech Biophotonics Lab 2024

Mentoring Experience

- **Siyu (Steven) Lin** [Graduate student, Caltech EE]
- **Shi Zhao** [Graduate student, Caltech EE]
- **Siying Kong** [Graduate student, Caltech EE]
- **Catherine Deng** [Undergraduate, Caltech EE, now graduate student at Stanford EECS] [Thesis Project]

MEDIA COVERAGE

Science.org | Observing soil bacterial ecosystems

Caltech News

- New Technology Images Microbes in 3D
- Haowen Zhou Awarded SPIE Optics and Photonics Scholarship
- Using AI to Predict the Spread of Lung Cancer

WashU Medicine | AI may predict spread of lung cancer to brain

Dayton Engineer | University of Dayton Electro-Optics and Photonics featured in Optica Journals and Conference