

# Shenghao Zheng

zhengshenghao666@gmail.com — +86 13298119850 — Research Gate — Google Scholar  
Personal Academic Website: Zheng Shenghao

## RESEARCH INTERESTS

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Computational imaging, Miniaturized device design, Computer Vision  
Deep learning methods and their applications in solving inverse imaging problems.

## EDUCATION

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**Harbin Institute of Technology**, Harbin, China

Master of Engineering in School of Instrumentation of Science and Engineering

Sept. 2022 — Jun. 2024

Cumulative GPA: 85.8/100

**Harbin Institute of Technology**, Harbin, China

Bachelor of Engineering in School of Instrumentation of Science and Engineering

Aug. 2018 — Jun. 2022

Cumulative GPA: 88.95/100

Ranking: 4/53 Percentage: 7.55%

## RESEARCH EXPERIENCE

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### Lensless imaging method based on mask modulation

June 2022 – June 2024

- Designed and set up the lensless masked imaging (LMI) system for data collection.
- Proposed a self-calibrated phase retrieval (SCPR) method that can jointly retrieve the binary amplitude mask and the complex wave field of a sample.
- Introduced the idea of wavefront decoupling into LMI systems, which was commonly used in ptychographic iterative engine (PIE) imaging systems.
- Proposed an enhanced self-calibrated phase retrieval (eSCPR) method that can realize single-shot, dynamic LMI.

### The 16th National Smart Car Competition

January 2021 – June 2021

- Worked on the computer vision part.
- Utilized the morphology and graphics algorithms to recognize the color of the traffic light and estimate the distance
- Trained a neural network to segment the lane from real-time captured pictures.
- Integrated the output from the camera and transfer the information to decision-making unit under ROS frame.
- Run all the code on Linux system with a Jeston nano main control board.

### Dual-constrained physics-enhanced untrained neural network for lensless imaging

June 2022 - October 2023

- Constructed the basic workflow of the self-supervised untrained DPENet with Mr. Zehua Wang.
- Set up the lensless imaging system and assisted in completing the data collection work.
- Assisted in replying to reviews' comments.

### Lensfree auto-focusing imaging with coarse-to-fine tuning method

June 2022 – June 2024

- Constructed the basic backbone of the sFocusNet with Mr. Zhihui Ding.
- Set up the experimental system and assisted in completing the data collection work.
- Assisted in replying to reviews' comments.

### A portable lensfree imaging platform based on prior-guided phase retrieval (submitted)

March 2024–Present

- Designed a LEGO-based lensfree microscopy, providing a low-cost DIY microscope scheme for hands-on science education.
- Proposed a prior-guided phase retrieval algorithm prGPR to realize a data-efficient recovery, where only two intensity images are required to perform high-fidelity imaging performance.

## PUBLICATIONS

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### Journal paper

- **Shenghao Zheng**, and Cheng Guo, "A portable lensfree imaging platform based on prior-guided phase retrieval," under peer-review
- **Shenghao Zheng**, Fannuo Xu, and Cheng Guo, "Single-shot lensless masked imaging with enhanced self-calibrated phase retrieval," Optics Letters 49, 3934-3937 (2024)
- **Shenghao Zheng**, Zhihui Ding, Rui Jiang, and Cheng Guo, "Lensless masked imaging with self-calibrated phase retrieval," Optics Letters 48, 3279-3282 (2023)

- Zehua Wang, **Shenghao Zheng**, Zihui Ding, and Cheng Guo, "Dual-constrained physics-enhanced untrained neural network for lensless imaging," Journal of the Optical Society of America A 41, 165-173 (2024)
- Zihui Ding, **Shenghao Zheng**, Feilong Zhang, Qiang Li, Cheng Guo. "Lensfree auto-focusing imaging with coarse-to-fine tuning method." Optics and Lasers in Engineering 181, 108366 (2024)
- Cheng Guo, Xianming Liu, Feilong Zhang, Yongbin Du, **Shenghao Zheng**, Zehua Wang, Xiaoqing Zhang, Xingchi Kan, Zhengjun Liu, and Weibo Wang, "Lensfree on-chip microscopy based on single-plane phase retrieval," Optics Express 30, 19855-19870 (2022)
- Cheng Guo, Feilong Zhang, Xianming Liu, Qiang Li, **Shenghao Zheng**, Jiubin Tan, Zhengjun Liu, Weibo Wang. "Lensfree auto-focusing imaging using nuclear norm of gradient." Optics and Lasers in Engineering 156, 107076 (2022)

## SELECTED COURSES

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### Master's Courses

- Nonlinear optics Grade: 90/100
- Numerical Analysis B Grade: 93/100

### Bachelor's Courses

- Linear Algebra and Analytic Geometry B Grade: 98/100
- Calculus B(1) Grade: 95/100
- Calculus B(2) Grade: 95/100
- Complex Function and Integral Transformation Grade: 94/100
- Engineering Optics (1) Grade: 91.3/100
- Engineering Optics (2) Grade: 93.5/100
- Electromagnetic Fields Grade: 95.1/100

## AWARDS

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**The 16th National Smart Car Competition** China  
First prize in the North division 2021

**The 9th National University Students' Opt-Sci-Tech Competition** China  
Second prize 2021

**The 10th National University Students' Opt-Sci-Tech Competition** China  
Second prize in the North-East division 2022

**TI Cup Heilongjiang Province Graduate Electronics Design Contest** China, Heilongjiang  
Second prize 2020.11

**Outstanding graduate student** China, Harbin Institute of Technology, 2022.

## SELECTED PROFESSIONAL SKILLS AND PERSONAL INTERESTS

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**Experiment Skills:** Construct different kinds of lensless imaging systems including lensless on-chip imaging systems, lensless masked imaging (LMI) systems, ptychographic iterative engine (PIE) imaging systems et al. Perform the experimental system to achieve the expected results.

### Programming Skills:

- **Matlab** (Proficient): Use programming language to reproduce physical processes. Build up mathematical models for the imaging system (LMI system, PIE et al). Establish the inverse problems and solve them mathematically.
- **Python** (Proficient): Construct various kinds of neural network models using Pytorch package. Perform supervised and self-supervised training. Call the pre-trained networks in matlab. Combine the advantages of the two programming languages (Python, Matlab) to solve the image inverse problems.
- **SolidWorks** (Proficient): Design 3-D printed adapters and connectors. Opto-mechanical system design and process.

**Hobbies:** Skiing and Snowboarding (skillful in snowboarding) — Badminton — Swimming