# Shenghao Zheng

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## RESEARCH INTERESTS

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

## EDUCATION

**Harbin Institute of Technology**, Harbin, China — Sept. 2022 — Jun. 2024
Master of Engineering in School of Instrumentation of Science and Engineering — Cumulative GPA: 85.8/100

**Harbin Institute of Technology**, Harbin, China — Aug. 2018 — Jun. 2022
Bachelor of Engineering in School of Instrumentation of Science and Engineering — Cumulative GPA: 88.95/100
Ranking: 4/53 Percentage: 7.55%

## RESEARCH EXPERIENCE

**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 information output from the camera and made motion decisions accordingly.
- Deployed all the codes on the 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.

**Lensfree brick-assembled microscopy based on prior-guided phase retrieval (on preparing)** March 2024–Present

- Designed a brick-assembled lensfree microscopy, providing a toy-based microscopic platform for preschool education.
- Proposed a prior-guided phase retrieval algorithm that can reconstruct the complex wavefield of samples with high quality and low running time.

## PUBLICATIONS

**Journal paper**

- **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**, Zhihui 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)

- Zhihui 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

**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

**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

**The 11th National University Students' Opt-Sci-Tech Competition** — China
Second prize in the North-East division — 2023

**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

**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