# Longqian Huang

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## EDUCATION

**School of Brain Science and Brain Medicine, Zhejiang University,** China          Sep 2022 – Sep 2023
Ph.D. in Neurobiology (withdrawn)

**Chu Kochen Honors College, Zhejiang University,** China          Sep 2018 – Jun 2022
B.Eng. in Opto-Electronics Information Science & Engineering (conferred in June 2022)

- GPA: 3.94/4.00; Rank: TOP 5% among 118

## RESEARCH INTERESTS

- Computational Imaging, Wavefront Sensing and Shaping, Meta-Optics

- Nonlinear and Quantum Optics

- Deep-tissue Microscopy, Optogenetics and Neuroscience

## PUBLICATIONS

1. Xu, H., Li, C., Wei, M., Zhou, Z., & **Huang, L.** (2023). Illumination strategies for space-bandwidth-time product improvement in Fourier ptychography. arXiv:2308.13933. (preprint)

2. **Huang, L.**, Luo, R., Liu, X., & Hao, X. (2022). Spectral imaging with deep learning. *Light: Science & Applications*, 11(1), 1-19. (**Cover**)

3. Zhang, W., Song, H., He, X., **Huang, L.**, Zhang, X., Zheng, J., ... & Liu, X. (2021). Deeply learned broadband encoding stochastic hyperspectral imaging. *Light: Science & Applications*, 10(1), 1-7.

## RESEARCH EXPERIENCE

**Physics Experimental Center, Zhejiang University**          Sep 2019 – Dec 2020
Advisor: Mr. Xing Chen
*Computational Holography*

- Employed the Gerchberg–Saxton (GS) algorithm with Fresnel diffraction to determine the Spatial Light Modulator (SLM) displayed phase.
- Generated a holographic phase stack by slicing the 3D object and progressively processing each slice with the GS algorithm.
- Realized dynamic 3D holographic display.

**State Key Lab of Modern Optical Instrumentation, Zhejiang University**          Jan 2020 – Aug 2021
Advisor: Prof. Xu Liu & Prof. Xiang Hao
*Computational Spectral Imaging*
Broadband Encoding Stochastic Hyperspectral Imaging

- Used broadband optical filters for encoding the object spectra and deep learning for decoding.
- Designed the broadband optical filters through physical simulation and deep learning.
- Achieved fast and accurate spectral image reconstruction (resolution 480x640x301, 0.48s).
- The result was published on *Light: Science & Applications*.

Review on Spectral Imaging with Deep Learning

- Categorized the spectra encoding strategies into amplitude-coded, phase-coded, and wavelength-coded.
- Derived the principles of each strategy in detail.
- The review was published on *Light: Science & Applications* and was chosen as the editor's pick and awarded the top downloaded papers in 2022.

**School of Brain Science and Brain Medicine, Zhejiang University**      Oct 2021 – Sep 2023
Advisor: Prof. Ke Si & Prof. Wei Gong
*Wavefront Sensing and Wavefront Shaping*

Project 1: Ultrasound-encoded Heterodyne Wavefront Sensing
- Built a Mach–Zehnder interferometer with each arm frequency modulated.
- Utilized an ultrasound transducer to induce a frequency shift for one arm at the ultrasound focus and an acoustic-optic modulator for a different frequency shift in the reference arm.
- Retrieved the wavefront via a four-phase shift method.

Project 2: Learning-based Shark-Hartmann Wavefront Sensor
- Created a transmission-setup optical system with a Shack-Hartmann wavefront sensor.
- Conducted calibration of the SLM and implemented the traditional Shack-Hartmann (SH) direct wavefront sensing method.
- Collected a dataset comprising aberration-SH image pairs and trained a neural network for fast aberration prediction.

Project 3: Multimode Fiber-based Wavefront Shaping
- Investigated the propagation properties of multimode fibers as a cylindrical waveguide.
- Applied self-reference interferometry to measure the transmission matrix of the fiber.
- Achieved focused output through the fiber with a high peak-to-background ratio.

**International research center for advanced photonics, Zhejiang University**      Aug 2021 – Present
Advisor: Prof. Peng Li
*Near-infrared OCT Oximetry*
- Applied spectral analysis and machine learning approaches to estimate oxygen levels in mouse retinal vessels, aiming to explore potential applications in clinical eye disease diagnosis.
- Utilized advanced OCT algorithms, such as OCT angiography (OCTA) and spectroscopic OCT (SOCT), to extract information from mouse retina OCT data.
- Employed machine learning algorithms and fit physical models to estimate oxygen levels in retinal vessels.

## Project Experience

**Chu Kochen Honors College Deep Research Project**      Jul 2020 – Jul 2021
Advisor: Dr. Peng Du
*Learning-based Action Recognition*
- Lead a four-student team in achieving action recognition in an embedded system.
- Developed the project with mixed Python and C++, incorporating OpenPose for extracting human skeleton features and STGCN for predicting human actions, and deployed them on a development board.
- Successfully deployed the system on a development board.

## Honors & Awards

- First Prize Scholarship of the Chinese Instrumentation and Measurement Society, 2022
- First-class Scholarship of Zhejiang University in 2022
- Top Ten New Academic Achievements of Zhejiang University Students, 2022
- Outstanding Graduates of Zhejiang University, 2022
- Meritorious Winner, Interdisciplinary Contest in Modeling (ICM), 2020 & 2021
- First Prize, Zhejiang Province Physics Innovation Competition, 2020

## Technical Skills

- Coding: Python (PyTorch, TensorFlow), MATLAB, C/C++, Kotlin
- Engineering: SolidWorks, CODE V/Zemax, Building Optical Systems (deal with SLM, DMD, AOM, etc.)