

# Longqian Huang

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## EDUCATION

**Zhejiang University, CKC Honors College**

China

Bachelor of Engineering

Sept. 2018 – June 2022

- Major: Opto-Electronics Information Science and Engineering
- GPA: 3.94/4.00

## PUBLICATIONS

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

Sept 2019 – Dec 2020

- Advisor: Xing Chen
- Research Area: Computational Holography
- We use the GS algorithm with a random initial phase to determine the phase pattern that is displayed on a spatial light modulator (SLM). We obtained a holographic phase stack by slicing the 3D object and progressively processing each slice with the GS. After displaying on the SLM, we realized dynamic 3D holography. After collimating and combining three wavelengths (green/red/blue) lasers with a wavelength compensation in the algorithm, we obtain colorful dynamic 3D holography.

**State Key Lab of Modern Optical Instrumentation, Zhejiang University**

January 2020 – August 2021

- Advisor: Prof. Xu Liu & Prof. Xiang Hao
- Research Area: Computational Spectral Imaging
- We use broadband optical filters to encode the object spectrum information and use deep learning to decode it. The broadband optical filters were designed with physical simulation and deep learning guidance. After fabrication and testing, we successfully achieved fast and accurate spectral image reconstruction (dimension 640x480x301, spectral channel 400nm–700nm, 1nm step). The article was received by *Light: Science & Applications*.
- I also conducted a survey about deep learning–empowered spectral imaging. Based on the fundamental properties of light, I categorized them into amplitude-coded, phase-coded, and wavelength-coded. The survey was written as a review article and was also received by *Light: Science & Applications*. This review was chosen as the editor’s pick (issue cover) and awarded the top downloaded papers in 2022.

**International research center for advanced photonics, Zhejiang University**

August 2021 – June 2022

- Advisor: Asso. Prof. Peng Li
- Research Area: OCT Oximetry
- I leveraged optical coherence tomography (OCT) and optical coherence tomography angiography (OCTA) to find the vascular properties of the mouse retina. I used MATLAB and data mining algorithms to process the data acquired from OCT imaging experiments. The research aims to develop a near-infrared snapshot OCT method for blood oxygen monitoring and retina artery/vein classification.

**School of Brain Science and Brain Medicine, Zhejiang University**

October 2021 – September 2023

- Mentor: Prof. Ke Si & Prof. Wei Gong
- Research Area: Wavefront Sensing and Wavefront Shaping

- I was trained in developing optical systems during this period. I developed three optical systems about wavefront sensing/shaping based on different principles: (1) Ultrasound-encoded heterodyne wavefront sensing, (2) learning-based Shark-Hartmann wavefront sensor, and (3) Multimode fiber-based wavefront shaping.
- The first system was my undergraduate thesis project. I completed half of the ultrasound-encoded digital optical phase conjugation system in this project. The system was a Mach-Zehnder interferometer setup. I used an ultrasound transducer to create a frequency shift for one arm at the ultrasound focus and an acoustic-optic modulator to create another frequency shift for another arm. I obtained a moving interferometry pattern at the CMOS plane and retrieved the wavefront via a four-phase shift method.
- The second system was a follow-up work on Dr. Lejia Hu's works. I created a simple test system for the Shack-Hartmann wavefront sensor in a transmission setup. I used an SLM to add simulated aberrations and used a direct wavefront sensing algorithm to reconstruct them. I then collected a number of aberration-SH image pairs as the dataset and trained a neural network with my teammate. The network was tested on simulated aberration and on 200-um brain slices, which had comparable performance to the traditional adaptive optics algorithms. This system is dedicated to a two-photon microscope for optogenetic studies.
- The third system was aimed at providing a powerful tool for neuroscience. In this system, I studied the propagation properties of multi-mode fibers as a cylindrical waveguide. I used an SLM for internal reference interferometry and obtained the transmission matrix of the fiber. I achieved high peak-to-background ratio optical focusing and can perform wavefront shaping through the fiber with the calculated transmission matrix. This system was dedicated to performing focus scanning fluorescence imaging for neuron imaging and stimulation.

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## PROJECT EXPERIENCE

### CKC Honors College Deep Research Project

July 2020 – July 2021

- In this program, I lead a four-student team to perform deep-learning-based action recognition in an embedded system. We developed with Python and C++, combining OpenPose and STGCN that were deployed on a development board, achieving real-time human action recognition.

### Student Research Training Program (SRTP), Zhejiang University

July 2020 – July 2021

- I collaborated closely with two students at the College of Computer Science and Technology, Zhejiang University in this program. We did a survey on augmented reality (AR) techniques and developed a simple AR demonstration APP. We wrote a mini-review that includes object tracking techniques, interaction techniques, and illumination techniques, which are fundamental techniques of AR.

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## HONORS & AWARDS

- First Prize Scholarship of the Chinese Instrumentation and Measurement Society in 2022
- Top Ten New Academic Achievements of Zhejiang University Students in 2022
- Outstanding graduates of Zhejiang University
- First-class scholarship of Zhejiang University in 2022
- Outstanding League cadres at the school level of Zhejiang University
- Meritorious Winner on 2021 Interdisciplinary Contest In Modeling (ICM)
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- First Prize of 2020 Zhejiang Province Physics Innovation Competition

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## TECHNICAL SKILLS

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