Luocheng Huang

Postdoctoral Researcher

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Education

Sep 2019 – Jun 2023 | **University of Washington, Seattle**
Ph.D. in Electrical and Computer Engineering

Jun 2017 – Sep 2019 | **University of Washington, Seattle**
Master of Science in Materials Science and Engineering

Sep 2013 – Jun 2017 | **University of Washington, Seattle**
Bachelor of Science in Materials Science and Engineering, Minor in Mathematics

Experience

Jul 2023 – Present | **University of Washington, Seattle**
Postdoctoral Fellow

- Development of a multi-scale optimization framework for diffractive optical systems (manuscript in preparation).

Jun 2022 – Dec 2022 | **Meta Reality Labs, Redmond**
Research Scientist Intern

- Worked as a research scientist intern.

Sep 2019 – Jun 2023 | **University of Washington, Seattle**
Graduate research assistant

2023

Broadband Thermal Meta-optics

- Employed an inverse-design framework to create broadband meta-optics operating in the long-wave infrared (LWIR) regime (8-12 µm) [1].

Optical Neural Network

- Designed an incoherent optical neural network capable of classifying MNIST characters using a meta-optical doublet [2].

2022

Meta-optical Fiber Endoscope

- Designed large meta-optics for real time full-color imaging in a meta-optical fiber endoscope [5]

Polarization Sensitive Foveated LWIR meta-optics

- Designed polarization sensitive meta-optics in the LWIR regime, which has polarization multiplexed focal lengths. [8]

2021

All-silicon LWIR Metalens

- Built a metalens imaging platform in the long wavelength infrared (LWIR) regime [11].

Inverse Designed Achromatic LWIR

- Inverse designed an achromatic LWIR imaging system, which is currently being fabricated. The optimization of the optics is enabled by techniques such as automatic differentiation and deep learning.

Liquid Crystal Tunable Metasurface

- Designed metasurfaces with tunable functionalities such as notch filters and beam steering using liquid crystal. Fabricated these metasurface for liquid crystal integration.

2020 | Extended Depth of Focus Metasurface
- Built an achromatic imaging platform combining the form factor of ultra-thin metasurface and computational imaging [15]. This imaging system utilizes the extended depth of focus (EDOF) property to enable full-color imaging.

Forward Designed Composite Metasurface
- Developed a doublet metasurface fabrication process flow. Designed metasurface doublets using Zemax. Developed python script to automate optimization and analyses on Zemax.

2019 | Simulation Parallelization
- Developed pipelines to run RCWA and FDTD simulations on the UW high performance computing cluster to considerably speed up the simulation workflows.

Oct 2017 – Jun 2018 | **University of Washington – DIRECT Program**
Trainee
- Developed Thermoelectric Materials Artifical Neural Network (TEMANN), a python package that can be used to predict Seebeck coefficients for novel materials. https://github.com/Luochenghuang/TEMANN/
- Completed courses on various topics concerning artificial neural networks including architectures, hyper-parameter tuning, regularization, optimization, etc.

Jul 2018 – Jun 2019 | **American Institutional Assets, Seattle**
Intern
- Helped to develop an organic industrial fertilizer.

Leadership and Teaching Experience

Sep 2019 – Jun 2021 | **University of Washington, Seattle**
Teaching assistant
- Held quiz sections and office hours for EE215 and EE299.

Sep 2016 – Jun 2017 | **American Ceramic Society – Keramos UW Chapter**
President
- Organized weekly meetings, and coordinated out reach events.

Technical Skills

Programming | Python, MATLAB, Java, JavaScript, HTML/CSS, LaTeX

Softwares | Zemax, Lumerical, SolidWorks, Proxmox, HAProxy, Tensorflow, PyTorch, SLURM

Optics | Alignment, PSF/Strehl Ratio measurement, optical stage and scientific camera automation (visible/LWIR), visible/LWIR sources, lasers, fiber optics, spectrometers, power meters.

Nanofabrication | ABM Semi-Auto aligner, Heidelberg DWL66$^+$, spin coater, Profilometer (DektakXT), EBeam Lithography (JBX6300FS), ellipsometer (Woollam Alpha SE), SEM, Optical Microscopy, Quorum sputter coater, E-beam Evaporator (SEC-600), ICP-Fluorine etcher, Evatec LLS EVO Sputter System, Barrel Asher, SPTS PECVD, Disco Wafer Dicer.

Prototyping | Soldering, breadboarding, table/band/scroll/miter/oscillating saw, jigsaw, router, planer, orbital/belt sander, lathe, 3D printing.

Publications

2023

[1] **L. Huang**, Z. Han, A. Wirth-Singh, V. Saragadam, S. Mukherjee, J. E. Fröch, J. Rollag, R. Gibson, J. R. Hendrickson, P. W. Hon, et al. "Broadband Thermal Imaging using Meta-Optics". In: *arXiv preprint arXiv:2307.11385* (2023). arXiv: 2307.11385 [physics.optics].

[2] **L. Huang**, Q. A. A. Tanguy, J. E. Froch, S. Mukherjee, K. F. Bohringer, and A. Majumdar. "Photonic Advantage of Optical Encoders". In: (2023). arXiv: 2305.01743 [physics.optics].

[3] A. Wirth-Singh, J. E. Fröch, Z. Han, **L. Huang**, S. Mukherjee, Z. Zhou, Z. Coppens, K. F. Böhringer, and A. Majumdar. "Large Field-of-View Thermal Imaging via All-Silicon Meta-Optics". In: (2023). arXiv: 2304.14569 [physics.optics].

2022

[4] J. E. Fröch, S. Colburn, A. Zhan, Z. Han, Z. Fang, A. Saxena, **L. Huang**, K. F. Böhringer, and A. Majumdar. "Dual Band Computational Infrared Spectroscopy via Large Aperture Meta-Optics". In: *ACS Photonics* (2022).

[5] J. E. Froech, **L. Huang**, Q. A. A. Tanguy, S. Colburn, A. Zhan, A. Ravagli, E. J. Seibel, K. Boehringer, and A. Majumdar. "Real Time Full-Color Imaging in a Meta-Optical Fiber Endoscope". In: (2022). arXiv: 2211.00808 [physics.optics].

[6] **L. Huang**, S. Colburn, A. Zhan, and A. Majumdar. "Full-Color Metaoptical Imaging in Visible Light". In: *Advanced Photonics Research* (2022), p. 2100265. DOI: 10.1002/adpr.202100265.

[8] V. Saragadam, Z. Han, V. Boominathan, **L. Huang**, S. Tan, J. E. Fröch, K. F. Böhringer, R. G. Baraniuk, A. Majumdar, and A. Veeraraghavan. "Foveated Thermal Computational Imaging in the Wild Using All-Silicon Meta-Optics". In: (2022). arXiv: 2212.06345 [physics.optics].

2021

[10] E. Bayati, A. Wolfram, S. Colburn, **L. Huang**, and A. Majumdar. "Design of achromatic augmented reality visors based on composite metasurfaces". In: *Applied Optics* 60.4 (2021), pp. 844–850.

[11] **L. Huang**, Z. Coppens, K. Hallman, Z. Han, K. F. Böhringer, N. Akozbek, A. Raman, and A. Majumdar. "Long wavelength infrared imaging under ambient thermal radiation via an all-silicon metalens". In: *Optical Materials Express* 11.9 (2021), pp. 2907–2914. DOI: 10.1364/OME.434362.

[13] E. Tseng, S. Colburn, J. Whitehead, **L. Huang**, S.-H. Baek, A. Majumdar, and F. Heide. "Neural nano-optics for high-quality thin lens imaging". In: *Nature Communications* 12.1 (Nov. 2021). DOI: 10.1038/s41467-021-26443-0.

[14] J. E. Whitehead, A. Zhan, S. Colburn, **L. Huang**, and A. Majumdar. "Fast Extended Depth of Focus Meta-Optics for Varifocal Functionality". In: *arXiv preprint arXiv:2106.15807* (2021).

2020

[15] **L. Huang**, J. Whitehead, S. Colburn, and A. Majumdar. "Design and analysis of extended depth of focus metalenses for achromatic computational imaging". In: *Photonics Research* 8.10 (2020), pp. 1613–1623. DOI: 10.1364/PRJ.396839.

2018

[16] S. Colburn, A. Zhan, E. Bayati, J. Whitehead, A. Ryou, **L. Huang**, and A. Majumdar. "Broadband transparent and CMOS-compatible flat optics with silicon nitride metasurfaces". In: *Optical Materials Express* 8.8 (2018), pp. 2330–2344.

Conferences

2022

[7] **L. Huang**, Z. Coppens, K. Hallman, Z. Han, K. F. Böhringer, N. Akozbek, A. Raman, and A. Majumdar. "All-Silicon Metalens for Long Wavelength Infrared Imaging". In: *2022 Conference on Lasers and Electro-Optics (CLEO)*. IEEE. 2022, pp. 1–2.

[9] Q. A. Tanguy, H. Hussein, S. Colburn, **L. Huang**, K. Böhringer, and A. Majumdar. "Electrothermal 1D Varifocal Metalens". In: *CLEO: Science and Innovations*. Optica Publishing Group. 2022, JTu4Q–1.

2021 | [12] **L. Huang**, J. Whitehead, S. Colburn, and A. Majumdar. "Extended Depth of Focus Metalenses for Achromatic Computational Imaging". In: *CLEO: Science and Innovations*. Optical Society of America. 2021, STh4O–2.

Honors

2022 | **Best Applied Research, ECE, UW**

2016 | **Livingston Wernecke Memorial Scholarship, UW**
James I. Mueller Scholarship, UW

2014 | **Composers Guild 44th Annual Composition Contest, Utah**
Utah Best of Young Composer & 2nd Prize & Best of Age Group, Utah

2013 | **National Scholastic Art & Writing Silver Medalist, New York**
Utah State Math Contest 1st Team Award & Finalist, Utah