Yuhang Li

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EDUCATION

University of California, Los Angeles, CA *09/2021 - Present*

Ph.D. Candidate in Electrical and Computer Engineering *GPA*: 3.975 / 4.0

Advisor: Prof. Aydogan Ozcan

Zhejiang University, Chu Kochen Honor College, Zhejiang, China *09/2017 - 06/2021*

Bachelor of Engineering *GPA*: 3.95 / 4.0

SELECTED HONORS AND AWARDS

Emil Wolf Outstanding Student Paper Competition at FiO+LS *2024*

Best Early Career Researcher Presentation (Silver) at SPIE Optics + Photonics *2023*

Departmental Fellowship, University of California, Los Angeles *2021-2023*

First-Class Scholarship for Outstanding Merits of Zhejiang University (top 5%) *2018-2020*

National Second-Level Athlete (Table Tennis)

RESEARCH EXPERIENCE

Chemical Sensing with Terahertz Spectrum, University of California, Los Angeles, CA *07/2024 - Present*

Advisor: Prof. Aydogan Ozcan & Prof. Mona Jarrahi

- Developed a Convolutional Neural Network (CNN)-based algorithm for chemical terahertz spectrum classification, achieving over 95% accuracy.
- Designed and implemented an Image Signal Processing (ISP) algorithm utilizing morphological operations to further improve classification accuracy.

Diffractive Optics-based Computational Imaging, University of California, Los Angeles, CA *09/2021 - Present*

Advisor: Prof. Aydogan Ozcan

- Inversely designed Diffractive Deep Neural Networks (D^2NNs) for advanced optical and quantitative phase imaging (QPI) through phase diffusers. Leveraged physical models and deep learning-based computational frameworks for system design.
- Designed a polarization transformer featuring diffractive layers and linear polarizer arrays. Synthesized complex-valued polarization scattering matrices, correlating various polarization states across the system's input and output fields of view.
- Designed a Diffractive Optical Element (DOE) for optical information concealment, enabling the transformation of images into deceptive patterns. Demonstrated the concept using Spatial Light Modulators (SLMs) within a holographic display system.
- Applied reinforcement learning (RL) algorithms, including policy gradient and proximal policy optimization, to optical neural networks. Conducted online training of physical systems to mitigate fabrication imperfections, misalignments, and other factors.

Spectral Kernel Machine with Tunable Photodetectors, University of California, Los Angeles, CA *07/2024 - 11/2024*

Advisor: Prof. Aydogan Ozcan, Collaborator: Dr. Dehui Zhang (UCB)

- Designed a spectral kernel using a genetic algorithm for in-situ training of the physical system, enabling the identification of different samples by learning from example objects without requiring prior spectral knowledge.

Super-resolution microscopy, Zhejiang University, China *03/2019 - 06/2021*

Advisor: Prof. Cuifang Kuang

- Developed a SAturated Competition microscope (SAC) for super-resolution imaging, achieving a two-fold improvement in lateral resolution.
- Conducted simulation of light-sample interactions, engineered algorithms to enhance 3D resolution, and validated system feasibility. Contributed to constructing the optical setup.

SELECTED PUBLICATIONS

1. **Li, Y.**, Chen, S., Bai, B., & Ozcan, A., 2024. Diffractive Lying Mirror. *(Under review, submitted to Nature Communication)*
2. **Li, Y.**, Li, J., & Ozcan, A., 2024. Nonlinear encoding in diffractive information processing using linear optical materials. *Light: Science & Applications*, 13(1), 173.
3. (*Review*) Li, X., Li, J., **Li, Y.**, Ozcan, A. and Jarrahi, M., 2023. High-throughput terahertz imaging: progress and challenges. *Light: Science & Applications*, 12(1), p.233.
4. **Li, Y.**$^{+}$, Li, J.$^{+}$, Zhao, Y., Gan, T., Hu, J., Jarrahi, M. and Ozcan, A., 2023. Universal Polarization Transformations: Spatial programming of polarization scattering matrices using a deep learning-designed diffractive polarization transformer. *Advanced Materials*.
5. **Li, Y.**, Gan, T., Bai, B., Işıl, Ç., Jarrahi, M. and Ozcan, A., 2023. Optical information transfer through random unknown diffusers using electronic encoding and diffractive decoding. *Advanced Photonics*, 5(4), p.046009.
6. **Li, Y.**, Luo, Y., Mengu, D., Bai, B. and Ozcan, A., 2023. Quantitative phase imaging (QPI) through random diffusers using a diffractive optical network. *Light: Advanced Manufacturing*, 4(19).
7. Bai, B.$^{+}$, **Li, Y.**$^{+}$, Luo, Y.$^{+}$, Li, X., Çetintaş, E., Jarrahi, M. and Ozcan, A., 2023. All-optical image classification through unknown random diffusers using a single-pixel diffractive network. *Light: Science & Applications*, 12(1), p.69.
8. Li, C., **Li, Y.**, Han, Y., Zhang, Z., Li, Y., Wang, W., Hao, X., Kuang, C. and Liu, X., 2020. Pulsed saturated absorption competition microscopy on nonbleaching nanoparticles. *ACS Photonics*, 7(7), pp.1788-1798.

SELECTED CONFERENCES PRESENTATIONS (*ORALS*)

1. **Y. Li**, T. Gan, B. Bai, C. Isil, M. Jarrahi and A. Ozcan, 2024, February. Optical information transfer through random unknown diffusers using a diffractive decoder with electronic encoding. In ***Frontiers in Optics***, Holographic Acquisition and Imaging, and Optical Processing (FM3B.2)
2. **Y. Li**, J. Li, Y. Zhao, T. Gan, J. Hu, M. Jarrahi and A. Ozcan, 2024, February. Universal polarization transformations using diffractive optical networks. In ***SPIE Photonics West***, AI and Optical Data Sciences V (12903-59)
3. **Y. Li**, Y. Luo, D. Mengu, B. Bai and A. Ozcan, 2023, August. All-optical quantitative phase imaging through random diffusers using a diffractive network. In ***SPIE Optics + Photonics***, Emerging Topics in Artificial Intelligence (ETAI) (12655-47)
4. B. Bai, **Y. Li**, Y. Luo, X. Li, E. Cetintas, M. Jarrahi and A. Ozcan, 2023, February. Object classification through unknown random diffusers using a single-pixel diffractive network and spectrum encoding. In ***SPIE Photonics West***, AI and Optical Data Sciences IV (12438-24)
5. **Li, Y.**, Luo, Y., Bai, B. and Ozcan, A., 2022, October. Diffractive optical imagers can see through random unknown diffusers. In ***Frontiers in Optics***, 3D Imaging and Display Applications (pp. FM5E-3).

INTERNSHIP EXPERIENCE

Optical metrology, Daheng Optics Incorporation, China *07/2020 – 08/2020*

Advisor: Dr. Yong Liu

- Developed a diffractive phase microscope utilizing zero-order and first-order interference to accurately reconstruct phase information of plastic micro-beads.
- Engineered a Time Domain Optical Coherence Tomography (TD-OCT) to extract the depth information of slides overlaid with multiple layers of tape.

TECHNICAL SKILLS

- **Programming Languages & Mathematical Tools**: Python, Matlab, C
- **Hardware & Prototyping Platforms**: Optical Component Mounting, Arduino, Raspberry Pi
- **Deep Learning Frameworks**: PyTorch, JAX, TensorFlow
- **Computer-Aided Design/Engineering**: Zemax, Tidy3D (FDTD & Adjoint method), Inventor, SolidWorks
- **Languages**: Native in Chinese, Fluent in English