Zachary Burns

zachburnst@gmail.com • https://zach-t-burns.github.io • (734)-355-9180 • San Diego, CA

Summary: I am a researcher with 5+ years of experience in **developing algorithms** for applications in **computational imaging and optics**. Currently seeking full time roles in industry in an R&D setting.

EXPERIENCE:

Meta Sunnyvale, CA
Research Scientist Intern June '24 – Sep. '24

- Contributed to the advancement of display technology for augmented reality (AR) devices
- Trained **neural network surrogate models** to reduce simulation times by 3 orders of magnitude
- Developed a new workflow utilizing **Generative AI** to optimize the geometry of diffractive optical structures
- Leveraged distributed computing techniques to **parallelize optical simulations** and reduced run times by 50x
- Demonstrated improvements in multiple AR device KPIs through the application of a newly developed optimization methodology

Element Biosciences San Diego, CA
Associate Data Scientist I Nov. '22 – Jan. '24

- Worked in R&D team focused on developing new **computer vision algorithms** for spatial multi-omics
- Used **deep learning** to improve recall and precision of genomics-related **image analysis**
- Experience working with Amazon Web Services to **train models via cloud computing**
- Optimized models to minimize size, decrease inference time, and deploy quantized versions to edge devices

Zhaowei Liu Research Group La Jolla, CA
Graduate Student Researcher Sep. '19 - Present

- Researched the use of **machine learning algorithms** for **super-resolution image reconstruction** in microscopy
- Developed several new techniques that used **self-supervised learning** for applications with no ground-truth data
- Explored the use of **physics-informed ML** by incorporating CNNs with traditional model-based algorithms
- Improved upon current state-of-the-art methods by increasing **generalizability** and **interpretability**
- Wrote code for algorithm implementations using **PyTorch** and **Tensorflow** for GPU based training

EDUCATION:

University of California, San Diego La Jolla, CA
Doctor of Philosophy (Ph.D.) in Electrical Engineering 2019 – 2025 (ABD)
NSF Graduate Research Program Fellow

University of Michigan Ann Arbor, MI
Bachelor of Science in Electrical Engineering 2015 - 2019
Bachelor of Science in Engineering Physics *Summa Cum Laude*

SKILLS:

Programming:	Python, MATLAB, C++, Shell scripting (working in Linux environment)
ML / Data Science:	PyTorch, Tensorflow, JAX, Keras, OpenCV, Scikit-learn, NumPy, Git, Jupyter, Docker, Amazon Web Services (AWS)
Algorithms and Optimization:	Deep learning, Convex Optimization, Signal and Image Processing, Computer Vision, FISTA, ADMM, Algorithm Unrolling, Physics-Informed ML
Optics and Imaging:	Fourier Optics, Diffractive Optics, Super Resolution, Computational Imaging, Microscopy, Camera Systems, RCWA, FDTD, FDFD

PUBLICATIONS:

- **Z. Burns**, J. Zhao, A. Z. Sahan, J. Zhang, Z. Liu, "High-speed blind structured illumination microscopy via unsupervised algorithm unrolling," (*under review*)
- G. Chen, **Z. Burns**, J. Zhao, Z. Liu, "Inverse design of metasurface based off-axis image relay," *Optics Express*, 32, 15115-15125 (2024)
- **Z. Burns**, Z. Liu, "Untrained, physics-informed neural networks for structured illumination microscopy," *Optics Express*, 31, 8714-8724 (2023)
- **Z. Burns**, Z. Liu**,** "Using untrained, physics-informed neural networks for structured illumination microscopy," *Emerging Topics in Artificial Intelligence (ETAI) 2022*, SPIE (2022)
- **Z. Burns**, J. Zhao, Y.U. Lee, Z. Liu, "Deep learning based metamaterial assisted illumination nanoscopy," *Emerging Topics in Artificial Intelligence (ETAI) 2021*, SPIE (2021)

HONORS AND AWARDS:

- NSF Graduate Research Fellowship Program recipient (2021- 2024)
- UCSD Electrical and Computer Engineering Departmental Fellowship (2019 - 2020)
- Summa Cum Laude at University of Michigan College of Engineering (2019)
- James B. Angell Scholar (2019)
- University of Michigan Regent's Merit Scholarship (2015-2016)

PROFESSSIONAL ACTIVITIES:

- SPIE Chapter at UCSD (2021-2024)
- UCSD Graduate Student Council (2021-2023)