

# ERIC CHEN

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## EDUCATION

**University of California, Los Angeles (UCLA)**

Ph.D., Electrical and Computer Engineering

**Los Angeles, CA**

Expected 2026

**University of Southern California (USC)**

M.S., Electrical Engineering MS Honors Program

**Los Angeles, CA**

December 2020

## PROJECTS

**Foundation Model for Computational Pathology and Virtual Staining** | Deep Learning

**Present**

- Developed first-of-its-kind Auto-fluorescence Foundation Model for Computational Pathology and Virtual Staining
- Engineered robust PyTorch data pipeline handling ~7TB of pathological images, reducing data loading time by 90%
- Managed and optimized distributed training processes on an 8-A100 GPU cluster using Slurm and PyTorch DDP
- Collaborated with 15+ pathologists, researchers and engineers to accelerate development and medical validation

**Diffusion Model-Based Consistent Super-Resolution Image Translation** | Deep Learning

**October 2024**

- Designed novel diffusion model-based super resolution virtual staining system, eliminating chemical staining needs
- Achieved state-of-the-art 5× super-resolution performance through Brownian bridge-based diffusion architecture
- Invented advanced sampling techniques for diffusion models through variance analysis, reducing output instability by up to 63% with enhanced image fidelity and clinical reliability

**Optical Generative Models** | Deep Learning

**October 2024**

- Architected world's first optical generative model, attaining 56% computation reduction in FLOPs while maintaining deep learning-comparable generation quality through hardware-software co-optimization
- Developed iterative optical generation framework producing 200k+ diverse facial images beyond CelebA distribution

**Fourier Imager Network (FIN): A Neural Network with Superior External Generalization** | Deep Learning

**August 2022**

- Pioneered groundbreaking neural network by innovating custom-designed Spatial Fourier Transform Modules, allowing unprecedented global receptive field processing for complex patterns
- Spearheaded first-ever end-to-end system for complex hologram reconstruction, delivering a 27× speedup over gold standard and ~10× over SOTA deep learning models while maintaining fidelity, empowering real-time applications
- Revolutionized external generalization through pure Fourier domain processing, securing robust performance on entirely unseen data distributions where SOTA models exhibit systematic failure

**GedankenNet: Self-supervised Learning Based on Physics Laws and Thought Experiments** | Deep Learning

**August 2023**

- Innovated self-supervised neural network leveraging physics-informed learning and non-laboratory data, eliminating dependencies on large-scale, high-quality labeled datasets
- Engineered breakthrough zero-shot imaging system enabling direct generalization to diverse experimental holograms with 24% quality improvement over SOTA supervised models

**eFIN: Generalizable Autofocusing and Super-Resolution in Holographic Imaging** | Deep Learning

**July 2023**

- Pioneered first-of-its-kind end-to-end holographic imaging network powering simultaneous autofocusing and super-resolution through novel attention mechanisms and dynamic feature extraction
- Surpassed SOTA performance by achieving 30% higher reconstruction quality while reducing input dimensions by 9x

**C-RNN: Convolutional Recurrent Neural Network for High-dimensional Image Reconstruction** | Deep Learning

**March 2021**

- Designed C-RNN specialized for high-dimensional image reconstruction from sparse, low-dimensional measurements
- Developed integrated pipeline for volumetric imaging and segmentation of *C. elegans* using C-RNN and Mask R-CNN

**RT-NRVE: Real-time Noise Reduction and Voice Enhancement using Deep Learning** | *Deep Learning* **May 2020**

- Engineered deep learning solution handling both stationary and non-stationary noise, demonstrated through 11k+ voice samples with 10 noise types, establishing new benchmarks against Wavenet and RNNoise
- Architected novel cascade CNN-RNN framework and custom data preprocessing pipeline, facilitating real-time voice processing and performance breakthrough across 0-15dB signal-to-noise ratio

**A Cloud Computing Based Optoelectronic Tweezer Control System** | *Software Development* **August 2018**

- Engineered wireless control system for optoelectronic tweezers with cross-platform interface on portable devices
- Structured cloud-based real-time image processing and path planning backend using C++/OpenCV and WebSocket

## EXPERIENCE

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**HHMI Undergraduate Research and Training Program** **Los Angeles, CA**

*Mentor* *September 2021 - Present*

- Spearheaded high-impact mentorship program for 4 undergraduates, resulting in 5 interdisciplinary research projects through structured daily guidance and weekly hands-on training sessions
- Architected and delivered advanced technical curriculum that supported students in mastering image processing, computational biophotonics, and ML techniques within 3 months
- Orchestrated cross-functional collaboration between postdoctoral scholars, senior graduate students, and undergraduate teams, leading to 5 public presentations at UCLA research labs open day
- Managed full research lifecycle from initial training to final presentations, ensuring 100% project completion and research excellence within 3 academic quarters

**University of Southern California** **Los Angeles, CA**

*Research Assistant* *September 2019 - August 2021*

- Collaborated with 5 senior researchers and co-authored a pioneering research paper on complex network analysis, resulting in a high-impact publication with 47 citations
- Led and managed a team of 6 researchers to collect and annotate 15,000+ social media posts containing COVID-19 truths/rumors for natural language processing
- Engineered automated data collection and cleaning pipeline using Python, regex patterns, and social media APIs, leading to 80% reduction in manual data processing time

## TECHNICAL SKILLS

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**Languages:** Python, Java, C/C++, MATLAB, JavaScript, HTML

**Technologies/Frameworks:** PyTorch, TensorFlow 1.x/2.x, JAX, Keras, Hugging Face, Lightning, OpenCV, ReactJS, Qt

**Developer Tools:** VS Code, Git, Docker, Jupyter, Android Studio, Xcode, AWS, Google Cloud Platform

## PUBLICATIONS (SELECTED)

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- **Chen, H.**, Huang, L., Liu, T., & Ozcan, A. (2022). Fourier Imager Network (FIN): A deep neural network for hologram reconstruction with superior external generalization. *Light: Science & Applications*, 11(1), 254. **(Citation 72. US Patent Pending)**
- Chen, S., Li, Y., **Chen, H.**, & Ozcan, A. Optical Generative Models. **(Submitted to Nature under peer review. US Patent Pending)**
- **Chen, H.**, Huang, L., Liu, T., & Ozcan, A. (2023). eFIN: enhanced Fourier imager network for generalizable autofocusing and pixel super-resolution in holographic imaging. *IEEE Journal of Selected Topics in Quantum Electronics*, 29(4: Biophotonics), 1-10.
- Huang, L., **Chen, H.**, Luo, Y., Rivenson, Y., & Ozcan, A. (2021). Recurrent neural network-based volumetric fluorescence microscopy. *Light: Science & Applications*, 10(1), 62. **(Citation 40)**
- Huang, L.<sup>‡</sup>, **Chen, H.**<sup>‡</sup>, Liu, T., & Ozcan, A. (2023). Self-supervised learning of hologram reconstruction using physics consistency. *Nature Machine Intelligence*, 5(8), 895-907. **(Citation 33)**
- Xiao, X.<sup>‡</sup>, **Chen, H.**<sup>‡</sup>, & Bogdan, P. (2021). Deciphering the generating rules and functionalities of complex networks. *Scientific reports*, 11(1), 22964. **(Citation 47)**

<sup>‡</sup> These two authors contributed equally