Eric Chen

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Summary

- Fourth-year Ph.D. candidate in ECE at UCLA with a GPA of 4.0, expected to graduate in June 2026
- Over **6 years of experience** in developing DL frameworks using PyTorch, TensorFlow, and JAX. Specialized in the full **computer vision** pipeline, including image acquisition, pre-processing, object detection & reconstruction, and image restoration
- Pioneered transformative DL methodologies bridging **theoretical** breakthroughs with **practical** applications. Utilized foundation models, diffusion models and **original DL frameworks** for super-resolution, highly generalizable image processing, and inverse imaging. Experienced in self-supervised learning, hardware-aware model design, edge inference, and embedded systems
- Published over 20 research articles in top-tier journals and conferences, achieving an **h-index of 10** with over 360 citations. Co-inventor on 2 pending **U.S. patents**
- Demonstrated exceptional interdisciplinary collaboration skills, bridging complex research domains and multidisciplinary teams

Education

University of California, Los Angeles (UCLA) **Los Angeles, CA**
Ph.D., Electrical and Computer Engineering, GPA 4.0 *Expected June 2026*

University of Southern California (USC) **Los Angeles, CA**
M.S., Electrical Engineering MS Honors Program, GPA 3.95 *December 2020*

Projects

Visual Foundation Model for Computational Pathology and Virtual Staining | *Deep Learning* **Present**
- Developed first-of-its-kind Auto-fluorescence Foundation Model based on Transformers for Computational Pathology
- 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

Conditional 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

FIN: Fourier Imager Network with Superior External Generalization for Image Processing | *Deep Learning* **August 2022**
- Pioneered groundbreaking deep learning framework for image processing and imaging inverse problems by innovating custom-designed Spatial Fourier Transform Modules, allowing global receptive field processing for complex patterns
- Spearheaded first-ever end-to-end system for complex 3D reconstruction from raw hologram captures, delivering a 27× speedup over gold standard and ~10× over SOTA deep learning models, 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 for imaging inverse problems, 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 Image Processing and Inverse Imaging | *Deep Learning* **July 2023**
- Pioneered first-of-its-kind end-to-end holographic imaging deep learning framework 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

Fluent Handwriting HID Using Embedded Deep Learning on Microcontrollers | *Embedded System* **December 2021**
- Developed a real-time handwriting recognition system by customizing a highly efficient CNN for Arduino Nano 33 BLE Sense, achieving 95.4% accuracy on embedded devices with touch user interface

- Implemented RTOS-based firmware and resolved TensorFlow Lite Micro quantization issues, enabling seamless deployment of deep learning models on resource-constrained microcontrollers without performance compromises
- Engineered a portable device with custom PCB design and 3D-printed enclosure, integrating low-power hardware and Bluetooth Low Energy (BLE) protocol for seamless user interaction and broad device compatibility

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, generating 200k+ diverse facial images during experiments

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 pipeline for 3D 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 multi-camera streaming, image processing and object detection backend using C++/OpenCV and WebSocket

Experience

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
- 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 for NLP. Implemented an automated data collection and cleaning pipeline using Python and regex patterns

Technical Skills

Languages: Python, Java, C/C++, MATLAB
Technologies/Frameworks: PyTorch, TensorFlow 1.x/2.x, JAX, Keras, Scikit-learn, OpenCV, Qt
Developer Tools: VS Code, Git, Docker, TensorBoard, Jupyter, Android Studio, Xcode, AWS

Publications (Selected)

- **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.‡, **Chen, H.‡**, 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.‡, **Chen, H.‡**, & Bogdan, P. (2021). Deciphering the generating rules and functionalities of complex networks. *Scientific reports*, 11(1), 22964. *(Citation 47)*

‡ These two authors contributed equally