

# Zhen Guo

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## EDUCATION

Massachusetts Institute of Technology

Expected: May 2024

Doctor of Philosophy, Computer Engineering, minors in Engineering Leadership

University of California, Berkeley

Graduation: May 2018

Bachelor of Art, highest honor in Physics, minors in EECS

## COURSEWORK

Physics & Engineering	Analytic Mechanics; Electrodynamics; Statistical Mechanics; Quantum Mechanics; Many-Body Theory; Solid-State Device; Photonics; Quantum & Nonlinear Optics;
Computer Science	Algorithms & Data Structure; Computer Architecture; Machine Learning; Hardware for Deep Learning; Computer Vision; Computational Photography;

## RESEARCH PUBLICATION

- Zhen Guo**, Zhiguang Liu, George Barbastathis, Qihang Zhang, Michael E. Glinsky, Bradley K. Alpert, Zachary H. Levine “*Noise-resilient deep tomographic imaging*”, **Optica** (reviewing).
- Zhen Guo**, Jung Ki Song, George Barbastathis, Michael E. Glinsky, Courtenay T. Vaughan, Kurt W. Larson, Bradley K. Alpert, Zachary H. Levine, “*Physics-assisted generative adversarial network for X-ray tomography*”, **Optics Express**.
- George Barbastathis, Jungki Song, Zilin Wu, Subeen Pang, **Zhen Guo**, “*LION: Learning to Invert 3D Objects by Neural Networks*”, **MTL Annual Research Report**.
- Jungki Song, Zachary H. Levine, **Zhen Guo**, George Barbastathis, Michael E. Glinsky, Bradley K. Alpert, “*Towards information limit in a low-photon three-dimensional X-ray imaging*”, **Computational Optical Sensing and Imaging**.
- Zhen Guo**, Abraham Levitan, George Barbastathis, Riccardo Comin “*Randomized probe imaging through deep k-learning*”, **Optics Express**.
- Cheng Gong, Xiang Zhang, Peiyao Zhang, Quanwei Li, **Zhen Guo**, Apoorva Chaturvedi, Arman Najafi, Shoufeng Lan, Xiaoze Liu, Yuan Wang, Shi-Jing Gong, Hao Zeng, Hua Zhang, Athos Petrou “*Ferromagnetism emerged from non-ferromagnetic atomic crystals*”, **Nature Communication** (reviewing).
- Hu Long, Thang Pham, Aiming Yan, **Zhen Guo**, Hiroya Ishida, Wu Shi, Sally Turner, S.Matt Gilbert, and Alex Zettl, “*Wafer-Scale On-Chip Synthesis and Field Emission Properties of Vertically Aligned Boron Nitride Based Nanofiber Arrays*”, **Applied Physics Letters**.

## RESEARCH PROJECTS

Physics-assisted machine learning for X-ray tomography

Jan. 2021 - Present

Department of Electrical Engineering and Computer Science at MIT

Prof. George & Dr. Zachary

- Monte Carlo simulation to compute conditional probability in imaging.
- Designed an algorithm “CircuitFaker” to emulate real world 3D circuits.
- Developed generative models for solving ill-conditioned X-ray tomography.

Randomized probe imaging through deep k-learning

Sep. 2020 - Oct. 2021

Department of Electrical Engineering and Computer Science at MIT

Advisor: Prof. George & Riccardo

- Formulated computational toolbox for diffractive imaging.
- Developed machine learning algorithms for Randomized probe imaging.
- Experimental demonstration of the algorithms using tabletop setup.

## Energy Efficient Deep Learning Photonics Crossbar Array

*Research Laboratory of Electronics at MIT*

Jan. 2020 - Aug. 2020

*Advisor: Prof. Dirk & Vivienne*

- Computational/theoretical estimation of crossbar performance/energy consumption.
- Inverse design using gradient based optimization algorithms.
- Timeloop and Accelergy analysis for different neural network workloads.
- GDS layout for photonic integrated circuits, system-level circuit simulation.
- Reinforcement Learning for search and fast beam steering.

## Terahertz Photonic Emission in Intrinsic Ferromagnetic Atomic Layers

*Department of Mechanical Engineering, University of California, Berkeley*

Jan. 2017 - Aug. 2018

*Advisor: Prof. Xiang Zhang*

- Developed software for lakeshore controller's module for closed-loop temperature monitoring.
- Automated polarization-resolved low temperature low frequency and high vacuum Raman measurement.
- Optically aligned the low frequency Raman spectroscopy with bragg notch filter, visible linear polarizer, band stop filter and half-wave plate.

## Enhanced Optical Valley Splitting Zeeman Effect by Proximity

*Department of Mechanical Engineering, University of California, Berkeley*

Feb. 2018 - May 2018

*Advisor: Prof. Xiang Zhang*

- High quality heterostructure preparation for magneto-optics Kerr effect and magnetic circular dichroism measurement via reflection in attoDRY2100 cryostat with 9 Tesla superconducting magnet.
- Developed attocube temperature and magnetic field scanning software system with adaptive optical focus via sub-nanometer piezo positioning controller from the lock-in amplifier feedback.

## Optical Characterizations and Mechanical Modulations of Electrostatic Graphene Speaker

*Department of Physics, University of California, Berkeley*

Dec. 2016 - May 2018

*Advisor: Prof. Alex Zettl*

- Graphene growth via chemical vapor disposition method, thin film wet transfers and speaker assembling.
- Employed spontaneous Raman spectroscopy to identify the strain and defects within the suspended graphene.
- Designed a dedicated mechanical apparatus to measure the force-displacement curve and the effective spring constant of the graphene diaphragm upon Young's modulus.
- Modulated the mechanical proprieties of graphene diaphragm via electron-beam lithography patterning and uni-axial strain compressing.

## Non-electronics Variable Tuning System for Hybridized In-Ear Monitor

*Sensible Recording and Rendering of Acoustic Science*

Aug. 2013 - Dec. 2016

*Director: Forrest Wei*

- Cross-compared the frequency response and analyzed the frequency division circuit designs of in-ear monitor.
- Advanced the frequency division circuit in the triple-driver In-Ear Monitor prototype and simulated the stability and durability test for the triple-driver In-Ear Monitor prototype.
- Deconstruction and reconstruction of the RS7, OutLaw 7075 and AT6012 audio system amplifiers.
- Realization of the variable-tuning system for the In-Ear Monitor.

## PRESENTATION

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### Randomized probe imaging through deep k-learning

*Computational Optical Sensing and Imaging*

July 2021

### Information-theoretic approach towards X-ray imaging 3D integrated circuits

*Computational Optical Sensing and Imaging*

July 2021

### Two-Dimensional Material in Modern Electronic Audio System

*Honor Seminar, Department of Physics, University of California, Berkeley*

April 2017

## SKILLS

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Python, Matlab, C++, Pytorch, Tensorflow, Github, AWS, Google Cloud, Linux, Keras, LaTeX