Personal Information

Brian Lerner

brianelerner@gmail.com
973-986-3318
linkedin.com/in/brian-lerner
github.com/brilerner

Research Objective

I use electronic health records to power machine learning models, and work with healthcare providers to make sure these models are useful, safe, and accurate. I have a particular focus on traumatic brain injury.

Education

Duke University

PhD Electrical and Computer Engineering, August 2021 - Present

Rutgers, The State University of New Jersey

BSc Physics (Professional Option), degree awarded May 2019

Research Experience

Graduate Researcher Duke University *September 2022-Present*

Advisors : Timothy Dunn

- Create cutting-edge ML models for improving traumatic brain injury care.
- Process and curate a large-scale dataset of patients with traumatic brain injuries derived from the electronic health record.
- Develop ML interpretability methods to enable deeper understanding of model decisions.

Student Research Affiliate Duke University *September 2022-Present*

Advisors : Ricardo Henao, Timothy Dunn

Program : Health Data Science Fall 2022 Research Program

- Develop a sophisticated model for the classification of brain abnormalities in CT scans.
- Meet with clinicians to ensure that the model is predicting outcomes that are useful in the real world.
- Determine metrics to gauge the performance of the model.

Graduate Researcher Duke University, Mikkelsen Lab *August 2021-September 2022*

Advisors : Maiken Mikkelsen

- Investigated the behavior of plasmonic metasurfaces, and applied the resultant discoveries to cutting-edge light sensors.
- Fabricated plasmonically-enhanced pyroelectric photodetectors sensitive to polarization and wavelength.
- Performed optical and electrical characterization of detectors over a wide wavelength range.
- Designed and programmed a single-pixel imaging setup.

SULI Intern Oak Ridge National Lab *August 2020-May 2021*

Advisors : Ben Lawrie, Peter Maksymovych

- Developed compressive sensing (CS) methods for scanning tunneling microscopy (STM).
- Created metrics for determining efficacy of CS for varied STM sample types.
- Characterized the limits of CS for STM images by testing reconstruction algorithms against different types of noise and sampling patterns.
- Programmed dynamic visualizations of reconstruction parameter space.
- Constructed framework for organized storage of data/metadata using xarray.
- Created interactive viewer for viewing multi-modal data obtained from electron microscopy.

SULI/HERE Intern Oak Ridge National Lab *August 2019-May 2020*

Advisors : Ben Lawrie, Eugene Dumitrescu

- Conducted research on superconducting nanowire single photon detectors (SNSPDs), focusing on the limits of spatial, number, and wavelength resolution for both visible and telecom detectors.

- Leveraged a high-BW oscilloscope to perform characterization and calibration using CW and pulsed light sources.
- Modeled the electrical dynamics of the SNSPD detection mechanism using LT Spice.
- Assisted in improving the thermal coupling of a dilution refrigerator housing SNSPDs.
- Built Python codebase to automate data acquisition and produce useful visualizations.
- Created Python bindings of C++ header files for lab instruments.

Research Assistant Rutgers University *May 2018-May 2019*

Advisor : Michael Gershenson

- Group focus : fabrication and characterization of superconducting quantum circuits.
- Developed method for in situ magnetron sputtering resistance measurements to facilitate more reliable deposition of aluminum oxide, in the process gaining exposure to nanolithography techniques.
- Modeled custom housing for in situ measurement and fabricated it using 3D printing.
- Created and soldered custom PCB for switching circuit to automatically change measurement processes of devices under test in dilution refrigerator.

Publications

P. Manjunath, **B. Lerner**, T. Dunn. "Towards Interactive and Interpretable Image Retrieval-Based Diagnosis : Enhancing Brain Tumor Classification with LLM Explanations and Latent Structure Preservation." *Artificial Intelligence in Medicine*, 2024. doi:10.1007/978-3-031-66535-6_35

V. Iyer, Y.S. Phang, A. Butler, J. Chen, **B.E. Lerner**, et al. "Near-field imaging of plasmonic nanopatch antennas with integrated semiconductor quantum dots." *APL Photonics*, 2021. doi:10.1063/5.0065524

B.E. Lerner, A. Flores-Garibay, B.J. Lawrie, P. Maksymovych. "Compressed sensing for scanning tunneling microscopy imaging of defects and disorder." *Phys. Rev. Research*, 2021. doi:10.1103/PhysRevResearch.3.043040

Y. Pai, C.E. Marvinney, M.A. Feldman, **B.E. Lerner**, Y.S. Phang, et al. "Magnetostriction of α-$RuCl_3$ flakes in the zigzag phase." *J. Phys. Chem. C*, 2021. doi:10.1021/acs.jpcc.1c07472

C.E. Marvinney, **B.E. Lerner**, A.A. Puretzky, A.J. Miller, B.J. Lawrie. "Waveform analysis of a large-area superconducting nanowire single photon detector." *Supercond. Sci. Technol.*, 2020. doi:10.1088/1361-6668/abd150

Teaching and Leadership Experience

Instructor of Record Bass Connections, Duke University *2024 - Present*

Project : Discovering AI Applications for Traumatic Brain Injury Care

- Constructed and led multidisciplinary team of 21 students and 6 faculty.
- Oversaw efforts to conduct a qualitative survey of healthcare providers, and simultaneously, a quantitative analysis of electronic health record data.
- Developed a curriculum to educate students on relevant subject matter.

Teaching Assistant Duke University *Fall 2023*

Class : Deep Neural Network Models of the Brain

- Led multiple classes when instructor was absent.
- Lead TA for grading and weekly office hours.

Presentations

Oral Presentations

"Position-Dependent Response of Large-Area Superconducting Nanowire Single Photon Detectors." The Annual Meeting of the APS Mid-Atlantic Section, 2020.

"Position-Dependent Response of Large-Area Superconducting Nanowire Single Photon Detectors." The Annual Meeting of the APS Southeastern Section, 2020.

"Lighting the way towards multi-photon resolution with SNSPDs." DOE Science Undergraduate Learning Internship IGNITE Presentations, Oak Ridge National Lab, 2019.

"In Situ Resistance Measurements During Sputtering." Physics Department Senior Thesis Presentations, Rutgers University, 2019.

Poster Presentations

"VNA to Z : Retrieving and Processing Duke Health CT Scans." AI Health Poster Showcase, Duke University, 2023.

"Using Deep Learning to Classify Traumatic Brain Injury in CT Scans." AI Health Poster Showcase, Duke University, 2022.

"Plasmonic Sensors for Spectrally-Sensitive Thermal Photodetection." Gordon Research Conference on Nanophotonics and Plasmonics, 2022.

"Impacts of Urban Weather on Building Energy Use." Smoky Mountains Computational Science and Engineering Conference Data Challenge, 2020.

"Wavelength, Number and Spatial Resolution of Superconducting Nanowire Single Photon Detectors." DOE Science Undergraduate Learning Internship Poster Session, Oak Ridge National Lab, 2019.

Honors and Awards

Rhodes Graduate Fellowship for Interdisciplinary Research, Duke University, 2024-2025

Best Student Paper, The 22nd International Conference on Artificial Intelligence in Medicine, 2024

Honorable Mention Paper, Smoky Mountains Computational Science and Engineering Conference - Data Challenge, 2020.

Best IGNITE Presentation, Oak Ridge National Lab SULI Internship Program, 2019.

Paul Robeson Scholar for completion of senior thesis, Rutgers University, 2019.

Recent Service

Mentor BOOST Beyond- Durham, NC *2023-2025*

- Met monthly with a high school mentee to provide general support, with a focus on preparing and completing the college admission process.
- Assisted in office hours to answer general questions for other students in the program.

Volunteer "I Have A Dream" Foundation- Newark, NJ *2018-2021*

- Prepare and deliver bags of food to at-need families associated with the foundation's partner school on a weekly basis.
- Spent time in Newark office brainstorming new initiatives and completing administrative tasks.
- Served as mentor for student in the foundation's high school level cohort.

Tutor Succeed2gether- Montclair, NJ *2020-2021*

- Assist Succeed2gether in their mission to provide educational services to those in need.
- Provide free tutoring in high school math and physics.
- Connect Succeed2gether with peers of mine who are looking to volunteer.