Leila Hudson

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Education

Electrical & Computer Engineering — *Princeton University*
Bachelor of Science and Engineering — *August 2020 – May 2024*

- *Concentration in Optics & Photonics and Applied Physics & Quantum Information*
- *Undergraduate Senior Thesis: Progress Towards Closed-Loop Control of Dynamic Spectrum Flattener*
- *Minor: Applications of Computing*

Electrical Engineering & Computer Science — *Massachusetts Institute of Technology*
Doctor of Philosophy of Engineering — *August 2024 – Present*

- *Masters Thesis: Fully Integrated, Monolithic Refractive Index Sensors in CMOS for Hydrogen Sensing*
- *Minor: Graphic Design*

Research Experience

Integrated Photonics Researcher — *Aug 2024 – Present*
Physical Optics and Electronics Group at MIT, Prof. Rajeev Ram — *Cambridge, MA*

- Developing a fully integrated, monolithic refractive index sensor in CMOS for hydrogen sensing for sustainable energy use applications

Astrophotonics Researcher — *Aug 2023 – May 2024*
Exoplanet Technology Lab at Caltech, Prof. Dimitri Mawet — *Princeton, NJ*

- Improving reduction, extraction, fitting, and subsequent control to achieve a flat spectrum with a laser frequency comb (LFC)
- Flattening power spectrum of an LFC by remotely controlling Mach-Zehnder Interferometers and Thermo-Optic Phase Modulators
- Tested algorithms in the field by adjusting super luminescent diode (SLD) at Exoplanet Technology Lab

Neuromorphic Photonics Researcher — *Aug 2022 – May 2024*
Lightwave Communications Lab at Princeton University, Prof. Paul Prucnal — *Princeton, NJ*

- Designed pulse shaping for analog receivers for photonic information processing applications
- Integrated photonic chip with an FPGA to improve blind source separation. Involved PCB design and photonic chip assembly, packaging, and testing
- Devised kernel decomposition algorithms for efficient image processing on photonics hardware
- Collaborating with Universal Display Corporation, specifically concerning research on AR and MR

Neuroengineering Researcher — *Feb 2021 – Aug 2021*
Jeanne Lab at Yale University, Prof. James Jeanne — *New Haven, CT*

- Constructed computational single, two-, and multi-compartment action potential models for fruit fly and simulated experimental results
- Studied effects of ion channels on action potential responses, synaptic input, and effects of A-current on temporal synaptic integration

Archaeogenetics Researcher — *Dec 2018 – Dec 2019*
Southold Indian Museum, Lakehead University Paleo-DNA Laboratory — *Southampton, NY*

- Assessed whether it is possible to extract and recover ancient DNA from oyster shells as old as 6,000 years
- Researched genetic differences between ancient and present oysters to explain why oyster population continues to decline dangerously, helping local native communities

Environmental Genetics Researcher *May 2018 – Aug 2018*
Stony Brook University *Southampton, NY*

- Tested the effectiveness of eDNA to determine the biodiversity of elasmobranch and fish species in Shinnecock Bay, NY
- Compared its performance to traditional methods such as underwater video monitoring and trawl sampling

Neuroscience Researcher *Jun 2017 – Aug 2017*
New York Medical College *Valhalla, NY*

- Performed vibratome brain sectioning and cryostat brain sectioning on a rat brain
- Performed immunohistochemistry using brain sections (in wells and on slides)
- Produced solutions such as PBS, reagents such as primary and secondary antibodies and ABC solution, and cover slipping slides
- Analyzed brain sections using Image Pro Plus and found significant trends in the cell counts
- Used EEG recordings to measure the severity of the seizures
- Assisted basic injections and weighing of rats in the animal lab

Work Experience

Laser Engineer *Jun 2023 – Aug 2023*
nLIGHT *Camas, WA*

- Assembled and characterized medical fiber laser systems using internally grown fiber to ascertain suitability for production; involved stripping, cleaving, splicing, integration, and testing of optical fibers; assembled 6 laser systems
- Conducted math derivations and physics simulations with refractive index profiles to determine optimal method to compute numerical aperture to inform growth of new fiber
- Led experiment to test effects of over melting splices on oscillations of signals
- Tested and accelerated new alignment software for production
- Built new engineering test stations to update and increase capability

Electrical Engineer *Feb 2023 – May 2024*
Bascom Hunter *Princeton, NJ*

- Sourced components for prototype build
- Created power budget to determine losses
- Researched scalability for new architecture
- Built and tested hardware for photonic neural network
- Troubleshot excess noise issues in large-scale photonic neural network demonstration

Co-Founder & CEO *Dec 2021 – July 2023*
Cruise *Princeton, NJ*

- Software engineer since inception of concept, principally involved with backend (text processing and machine learning) and frontend development (Chrome Extension)
- Chrome Extension for Google Docs to help increase writing productivity and creativity for middle and high school students who are dependent on ChatGPT
- Funded by NSF (I-Corps Hub Regional Program); conducted customer interviews
- Hired software engineers and business managers, supervised team, and competed in pitch competitions

Graphic Designer *Jan 2023 – May 2024*
Princeton Lewis Center for the Arts *Princeton, NJ*

- Designing and adapting designs for posters, flyers, ads, etc. for Creative Writing, Dance, Music Theater, Theater, Visual Arts, Film/Video, and the Princeton Atelier event
- Use InDesign, Illustrator, and Photoshop

Full-Stack Software Engineer *May 2022 – Feb 2023*
MGME NeuroTech *Zurich, Switzerland*

- Developed backend (automatic psychology experiments, data engineering with multiple data sources, and machine learning)
- Developed frontend (improving upon a pupillometry application and communicating with backend)

Founder & President *Jun 2021 – Jun 2023*
NeuroTech Club *Princeton, NJ*

- Spearheaded club through university approval, organizing software and hardware workshops, attaining funding for new technology, managing other club positions, and offering advice to students

Water Treatment Researcher *Jun 2019 – Feb 2020*
Yorktown Town Board, Councilman Vishnu Patel *Yorktown Heights, NY*

- Conducted research on surveying and improving the town's water usage
- Presented results to the town board and recommended the allocation of funding towards further study to implement household water metering in Yorktown

Projects

Complete Integrated Photonic Link *May 2023 – June 2023*
Independent Project *Princeton, NJ*

- Designed and simulated two photonic integrated designs, one for wavelength division multiplexed (WDM) data modulation and one for WDM data detection
- Consisted of transmitter and receiver chip
- Developed with GDSFactory, GDS files, and KLayout

NOMI - Neurally Operated Musical Instrument *Jul 2021 – Aug 2021*
natHACKS Hackathon *Remote*

- Neurofeedback software that allows users to create music by altering/ learning to control their brain state
- Utilizes real-time EEG data to estimate the brain state of the user
- Supports two modes of operation: relaxation and concentration

Publications

Zhang, W., Lederman, J. C., de Lima, T. F., Zhang, J., Bilodeau, S., Hudson, L., Tait, A., Shastri, B. J.; Prucnal, P. R. (2023, October 19). A system-on-chip microwave photonic processor solves dynamic RF interference in real time with picosecond latency. arXiv.org. https://www.nature.com/articles/nature16454

Conferences

SPIE Optics + Photonics Conference, San Diego, CA, August 20-24, 2023

SPIE-CLP Conference on Advanced Photonics, San Diego, CA, August 22-23, 2023

Grace Hopper Celebration of Women in Computing, Orlando, FL, September 26-29, 2023

Honors & Awards

Irwin Mark Jacobs and Joan Klein Jacobs Presidential Fellowship *Sep 2024 - May 2025*
Issued by MIT Electrical Engineering and Computer Science Department *Boston, MA*

Fellowships are offered to newly admitted PhD students who have demonstrated exemplary academic and research achievements, and thus show great promise for future accomplishments.

Electrical & Computer Engineering and SEAS Fund *Sep 2022 – May 2024*
Issued by Kamran Rafieyan '89 and SEAS *Princeton, NJ*

Received funding from Electrical & Computer Engineering Department and School of Engineering and Applied Science to carry out junior fall and spring semester independent work as well as senior thesis work. Purchased hardware equipment that is used to run algorithms that the student devised. These algorithms allow photonic hardware to run convolutional neural network computations to carry out image processing. Also purchased FPGA, resistors, and capacitors used for chip assembly and packaging for integrated photonic chip and FPGA system for blind source separation applications. Traveled to Caltech to conduct field-testing of closed-loop control algorithm.

Streicker International Fellows Fund *May - Aug 2022*
Issued by Princeton & John H. Streicker '64 *Zurich, Switzerland*

The Streicker International Fellows Fund was established in early 2015 by John H. Streicker '64 to provide undergraduate students the opportunity to carry out substantive research or educational projects while immersed in a foreign culture. Streicker Fellows design their own projects or internships in conjunction with a hosting organization, in any academic or professional area, and in any geographic region outside of the United States.

ThinkSwiss Research Scholarship *May - Aug 2022*
Issued by Embassy of Switzerland *Zurich, Switzerland*

ThinkSwiss is a scholarship program managed by the Office of Science, Technology, and Higher Education at the Embassy of Switzerland in Washington, D.C. The program is funded by the State Secretariat for Education, Research and Innovation (SERI) and is supported by the Embassy of Switzerland in Ottawa, Canada. The aim of the program is to promote research opportunities in Switzerland for American and Canadian students and to foster exchange between Swiss, U.S., and Canadian universities and research institutions.

Music

Substitute Harpist *Sep 2024 – Present*
Boston Philharmonic Orchestra & Boston Youth Philharmonic Orchestra *Boston, MA*

- Substitute harpist for semi-professional orchestras
- Went on two-week tour to Mexico with Boston Youth Philharmonic Orchestra in June 2025

Principal Harpist *Sep 2020 – May 2024*
Princeton University Orchestra *Princeton, NJ*

- University's premier orchestra ensemble
- Performs 8 times a year as well as international tours

Harpist & Soloist *Sep 2021 – May 2024*
Princeton University Sinfonia *Princeton, NJ*

- University's alternate orchestra
- Performed concerto with orchestra in May 2024

Harpist *Summer 2018 & 2019*
National Youth Orchestra of the United States 2 *New York, NY & Miami Beach, FL*

- Ensemble is comprised of the best musicians from across the nation
- Performed at Carnegie Hall and New World Center under Maestro Carlos Miguel Prieto

Principal Harpist *Sep 2018 – May 2020*
New York Youth Symphony *New York, NY*

- Performed at Carnegie Hall three times each year under Maestro Michael Repper
- Grammy award winning for Best Orchestral Performance 2023

Skills

Software	Python, Javascript, C/C++, Java, CSS/HTML, Verilog, MATLAB, Git, Go, InDesign, Photoshop, Illustrator
Hardware	Altium, KLayout, GDSFactory, laser training (Class 4), cleanroom training, SMD & TH Soldering, Oscilloscope, Waveform Generator, Cleaving & Splicing
Languages	English, Arabic, French
Extracurriculars	Speedskating, Running, Cycling, Swimming

Coursework

Hardware/Theory	Photonic Systems, Quantum Optics, Nonlinear Optics, Photonics and Lightwave Communications, Quantum Engineering, Foundations of Modern Optics, Robotic and Autonomous Systems Lab, Optical and Quantum Electronics, Thermal Physics, Electronic Circuit Design, Contemporary Logic Design, Information SignalsIndependent Work (Fall & Spring), Senior Thesis (Fall & Spring)
Software/Theory	Programming Systems, Electronic Music, Algorithms and Data Structures, Principles of Computer System Design, Introduction to Machine Learning
Science & Mathematics	Classical Mechanics, Electromagnetism, Calculus I, II, and III, Linear Algebra, Differential Equations, Probability and Stochastic Systems
Humanities	Functional Neuroanatomy, Social Psychology, Typography, Advanced Graphic Design, Practices and Principles of Rhythm, Fundamentals of Jazz, Computer and Electronic Music Composition, Arabic (Beginner and Intermediate), Arts of the Islamic World