

Pranav Rane

10105 Grayhorse Court
Potomac, MD, 20854

www.pranavrane.com
prane@haverford.edu

Summary

Research assistant with over 4 years of experience in computing, physics, and mechanical engineering. Skills in data analysis, problem solving, and critical thinking. Interested in pursuing research at the intersection of mechanical engineering, computer science, and physics for Fall 2025.

Education

Haverford College

B.S. Physics, B.S. Computer Science, minor: Applied Mathematics (3.9/4.0)

August 2021 – May 2025

Haverford, PA

Experience

Research Assistant

July 2020 – Present

University of Utah, Department of Mechanical Engineering (advisor: Dr. Michael Czabaj)

Salt Lake City, UT

- Implemented a convolutional neural network with >90% accuracy to improve fiber segmentation of fiber-reinforced composites (FRCs) from X-ray tomographic images.
- Created a computer vision model to quantify measurement results for double cantilever beam tests.
- Implemented a multi-objective optimization algorithm to improve mechanical properties of FRCs.
- Created a novel method to provide an efficient fracture constraint for 2-D concave fiber cross sections.
- Presented in project meetings weekly and supervised graduate student work.

Research Assistant

May 2024 – August 2024

Georgia Institute of Technology, School of Physics (advisors: Dr. Phillip First, Dr. Zhigang Jiang)

Atlanta, GA

- Worked with Georgia Tech professors on NASA and NSF-funded research to investigate formation and subsurface distribution of water on the Moon.
- Implemented instance segmentation algorithm to identify and segment damaged regions in lunar-relevant materials. Results presented at Sandia National Laboratory Machine Learning Conference.
- Performed and analyzed data from laboratory ion irradiation on lunar-relevant materials using scanning electron microscopy.
- Analysis of scanning transmission electron microscopy and atomic force microscopy data.
- Characterization of Apollo 17 lunar sample using energy dispersive X-ray spectroscopy and photoluminescence.

Electronics, Oscillations, and Advanced Quantum Laboratory

August 2021 – May 2022

Haverford College, Department of Physics and Astronomy

Haverford, PA

- Conducted electron spin resonance of DPPH to measure its g-factor and excited state lifetime.
- Performed atomic absorption spectroscopy on indium phosphide quantum dots.
- Conducted material characterization of a graphite specimen via electron diffraction.
- Analyzed the laser modes and gain profile of a helium-neon laser using optical equipment.
- Wrote scientific manuscripts for physics experiments in radioactivity, polarization, and optics.

Advanced Physics Laboratory

August 2023 – December 2023

Haverford College, Department of Physics and Astronomy

Haverford, PA

- Implemented several semiconductor and quantum analog experiments for future students.
- Ran optical experiments confirming the existence of photons and used SPDC to show nonlocality.

Chemical Bonding Laboratory

August 2023 – December 2023

Haverford College, Department of Chemistry

Haverford, PA

- Synthesized ferric oxalate salts and performed purification via slow recrystallization.
- Confirmed the chemical formula of synthesized oxalate salt through titration with potassium permanganate, atomic absorption spectroscopy, and flame tests.
- Identified the constituents of an unknown compound via mass spectrometry, infrared spectroscopy, and proton NMR spectroscopy.

Scientific Computing and Data Structures Laboratory

January 2022 – December 2022

Haverford College, Department of Computer Science

Haverford, PA

- Implemented algorithms for numerical differentiation, integration, and solving systems of DEQs.
- Created an algorithm to optimize housing locations to maximize access to public transportation.
- Led a project using real-time data to optimize passenger costs and flight time for air travel.

Systems Programming Laboratory

January 2023 – May 2023

Bryn Mawr College, Department of Computer Science

Bryn Mawr, PA

- Enabled a 4x performance increase by designing multi-threaded code to analyze the Mandelbrot set.
- Implemented low-level algorithms and data structures while practicing memory allocation techniques.

Publications

P. Rane, M. Czabaj. (2024). Genetic optimization of carbon fiber cross-section shape for tailorable compressive and transverse properties. (*manuscript in preparation*).

Patents

P. Rane, M. Czabaj. (2024). Three-lobed fiber for improved mechanical properties of fiber-reinforce composites. (*patent disclosure filed*).

Talks

Characterization of Ion-Induced Damage: Application of Convolutional Neural Networks, Sandia National Laboratory Machine and Deep Learning Conference (September 2024).

The Formation of Water on the Moon, Georgia Tech College of Sciences REU Program (July 2024).

Awards & Honors

CSCA Academic All-District Team

Haverford College Baseball

2023

Presidential Scholarship & De La Salle Scholar

St. John's College High School

2016-2020