

Adam Field

Physics Undergraduate — Computational Astrophysics Researcher

www.adamfield.org

Research Profile

Physics undergraduate specializing in computational astrophysics with expertise in machine learning applications to cosmology. Proven track record in developing neural network-based galaxy shear estimators and processing large astronomical datasets. Strong foundation in high-performance computing, JAX/GPU acceleration, and weak gravitational lensing methodologies.

Education

Worcester Polytechnic Institute, Worcester, MA

Expected May 2027

B.S. Physics, Minor in Mathematics — GPA: 3.50/4.0

Relevant Coursework: Graduate-level Classical Mechanics & Mathematical Methods in Physics, Differential Geometry, Real Analysis, Intermediate Physics Laboratory

Research Experience

ShearNet — Neural Network Shear Estimator

June 2025 – Present

Research Assistant — Northeastern University (Dr. Sayan Saha)

- Developing neural network-based galaxy shear estimator with JAX GPU acceleration, contributing to core pipeline that process 10,000 galaxy observations per minute
- Managing simulation and benchmarking tools for performance validation on HPC cluster
- Currently implementing deconvolution neural network for metacalibration, improving shear estimation bias drastically

Weak Gravitational Lensing Study

Oct 2024 – May 2025

Independent Research — Worcester Polytechnic Institute (Prof. Källan Berglund)

- Processed astronomical FITS files taken by SuperBIT telescope using SuperBIT lensing pipeline
- Conducted comprehensive literature review of current weak lensing techniques, focusing on *Lensing in the Blue II* methodologies
- Gained expertise in high-performance computing clusters and Linux terminal operations for large-scale data analysis

Computational Thermodynamics & Game Theory

July 2025 – Present

Quantum Games Research — Worcester Polytechnic Institute (Dr. Jackson Henry)

- Extending *Community Formation in Wealth-Mediated Thermodynamic Strategy Evolution*, implementing zero-sum payout game simulations
- Beginning to explore cellular automaton, enabled through live updating PyQT GUI and GPU accelerated simulations
- Working on alternative characterizations of system entropy, new network topologies, and better visualizations of evolution.

Gravitational Lensing Digital Filter Project

June 2024 – Jan 2025

Research Developer — Harvard Black Hole Initiative (Dr. Dominic Chang)

- Developed gravitational lensing digital camera filter using JavaScript, HTML, CSS, Three.js, and GLSL
- Created real-time visualization algorithms for black hole lensing effects, enabled by GPU shaders
- Contributed to iOS app "Black Hole Vision" for public science education

Biophysics Laboratory

Oct 2023 – May 2024

Lab Assistant — Worcester Polytechnic Institute (Prof. Izabela Stroe)

- Analyzed biophysics datasets using Igor Pro, identifying trends and patterns in experimental datasets
- Developed automated Python visualization solution using matplotlib, reducing analysis time by 50%
- Contributed to laboratory data processing workflows and experimental methodology

Technical Skills

Programming: Python, JAX/Flax, JavaScript, Java

Scientific Computing: GPU Computing, Numerical Methods, HPC Clusters, SLURM

Data Analysis: Astronomical FITS processing, Statistical analysis, Machine Learning

Development Tools: Git/GitHub, Linux (Ubuntu), LaTeX

Visualization: Matplotlib, WebGL, Three.js, OpenCV

Professional Activities & Memberships

American Physical Society (APS), Student Member 2023 – Present

Society of Physics Students (SPS), WPI Chapter 2023 – Present

Active participant in monthly meetings and physics outreach events

Open Source Contributions: ShearNet neural network codebase (MIT License)

Professional GitHub: github.com/AdamField118 — 12+ repositories, 300+ commits

Projects & Applications

Chaotic Double Pendulum Analysis

Spring 2025

- Developed numerical simulation tracking real-world pendulum motion from video analysis
- Utilized WPI computer cluster to simulate 5,000 pendulums with nano-radian separation, demonstrating chaos theory principles
- Delivered presentation and poster at Intermediate Physics Lab showcase

Differential Geometry Capstone Lecture

Spring 2025

Mathematics Minor Requirement

- Delivered comprehensive lecture on curvature computation for surfaces, covering Weingarten maps and principal curvatures
- Presented interdisciplinary applications including brain development analysis, computer graphics optimization, and spacetime curvature in General Relativity
- Demonstrated mathematical derivations for Weingarten maps, connecting abstract differential geometry to real-world physics problems

Science Communication & Outreach

2025 – Present

- Created educational physics videos on YouTube explaining complex concepts like astronomy and general physics
- Published technical blogs on adamfield.org covering research methodologies and physics insights
- Developed interactive WebGL simulations (portfolio.adamfield.org) for undergraduate physics education

Teaching & Leadership

Peer Learning Assistant, Worcester Polytechnic Institute

2024 – Present

Support undergraduate physics students through active learning sessions and collaborative problem-solving workshops

Assistant Scoutmaster

2022 – 2025

Eagle Scout Project Leader

2020

Designed dugouts with benches and sun covers using SolidWorks CAD software. Led fundraising campaign securing \$3000 in materials and coordinated 15+ volunteers. Managed complete project lifecycle from design through construction, refurbishing community wiffleball field.

Honors & Recognition

Dean's List, Worcester Polytechnic Institute	Spring 2025
Presidential Scholarship, Worcester Polytechnic Institute	2023
Gordon Lankton Scholarship, Worcester Polytechnic Institute	2023
Excellence in Physics, American Association of Physics Teachers	2023