Daksh Bhatt

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EDUCATION

2022 - 2025

University of Massachusetts, Amherst

B.S. Astronomy & Physics

College of Natural Sciences & Commonwealth Honors College

Relevant Coursework:

Galactic Astronomy and Cosmology, Stellar Astrophysics, Quantum Mechanics, Classical Mechanics, Electrodynamics, Statistical Mechanics, Computational Physics, Techniques of Theoretical Physics, Intermediate Laboratory.

RESEARCH EXPERIENCE

Feb 2025 - Present

Research Assistant, Calzetti Group

Independent Study

PI: Prof. Daniella Calzetti

Conducting stellar photometry and dust attenuation studies in nearby galaxies, focusing on the M33 galaxy.

- Automated aperture photometry on over 1,200 stellar clusters in multi-band imaging using custom Python code, incorporating a centering algorithm to improve flux accuracy.
- Constructed U–B vs. V–I color–color diagrams to assess the influence of interstellar dust on observed stellar populations and their optical colors.
- Compared photometric measurements to stellar population models to quantify dust-induced age biases, with the goal of deriving empirical corrections for dusty extragalactic systems.

May 2024 - Dec 2024

Research Assistant, nEXO, PocarGroup

Full Time/Independent Study

PI: Prof. Andrea Pocar

Worked on the R&D phase of the nEXO experiment, a next-generation search for neutrinoless double beta decay in xenon-136 using a 5-ton liquid xenon time projection chamber (TPC).

- Modeled photon transport efficiency in liquid xenon detectors using GPU-accelerated optical simulations with Chroma, focusing on geometries relevant to the nEXO experiment.
- Analyzed the effects of CAD tessellation resolution on light collection by SiPMs, isolating artifacts from surface triangulation and comparing performance of curved versus flat reflectors.
- Authored internal technical documentation on simulation best practices and presented results at the 2024 APS DNP Conference and nEXO Collaboration Meetings.

Feb 2023 - May 2023

Research Assistant, LUX-ZEPLIN, HertelGroup

Independent Study

PI: Prof. Scott Hertel

Joined the Hertel Group during my freshman year to support early-stage experimental development in low-temperature dark matter detection using novel target media such as liquid helium.

- Designed and built a prototype mechanical switch to control cryogenic detector hardware developed at UMass without introducing additional heat to the low-temperature environment.
- Repurposed LEGO components—leveraging their ABS plastic and precision interlocking design—to achieve reliable, non-conductive actuation suitable for delicate experimental setups.
- Supported broader group efforts contributing to the LUX-ZEPLIN (LZ) experiment, which aims to detect weakly interacting massive particles (WIMPs) via low-background, high-sensitivity instrumentation.

PUBLICATIONS

Aug 2024

Effect of Surface Resolution on Ray-Tracing Optical Simulations, nEXO

Authored a technical internal research memo for the nEXO simulation group. Investigated the impact of surface resolution and CAD geometry variations on optical simulations using Chroma, a GPU-based ray-tracing framework in Python. Results informed simulation practices within the PocarGroup at UMass and the nEXO collaboration.

PRESENTATIONS

Oct 2024

American Physics Society, Division of Nuclear Physics - CEU

Presented research on optical simulation fidelity in LXe environments using Chroma. Demonstrated how surface tessellation in CAD-generated geometries affects photon transport efficiency predictions, with implications for detector modeling in the nEXO experiment. [Abstract, Poster]

TEACHING EXPERIENCE

Feb 2025 - May 2025

Teaching Assistant: PHYS281 - Computational Physics

Supervisor: Prof. Shubha Tewari

Supported instruction in Python-based scientific computing; assisted with debugging, data analysis, and simulations during labs and office hours, and evaluated code-based project work.

Sept 2024 - Dec 2024

Teaching Assistant: PHYS131 - Introduction to Mechanics

Supervisor: Prof. Heath Hatch

Assisted students during class and office hours, guided problem-solving in mechanics, graded assignments and exams, and led review sessions to reinforce conceptual understanding.

Feb 2024 - May 2024

Teaching Assistant: ASTRON105 - Weather and Astronomy

Supervisor: Prof. Don Candella

Conducted weekly office hours and graded assignments for a general education course introducing 120+ non-major students to weather phenomena through the lens of basic physics and astronomy.

Sept 2023 - May 2025

Lab Assistant: ASTRON100 - Exploring the Universe

Supervisor: Prof. Stephen Schneider

Assisted first-year astronomy majors during lab sessions, helping students navigate Stellarium software and apply core astronomy concepts to night sky simulations..

MENTORING EXPERIENCE

May 2024 - December 2024

University of Massachusetts, Amherst

Invited by the Department of Astronomy. Paired with three first-year students to provide academic and social support, offer course and research guidance, and help them navigate the department and adjust to college life.

Feb 2023 - Aug 2023

Rocketry Club, New Student Orientation Mentor

University of Massachusetts, Amherst

Nominated by club members to mentor incoming students; organized onboarding meetings and conducted bi-monthly check-ins to support integration into the team and its projects.

HONORS AND AWARDS

2024

APS DNP Fall 2024 Meeting, Boston

Peer Mentor: Astronomy

Awarded full travel, housing, and registration support by the American Physical Society to present research.

F'24, S'25

Dean's List, University of Massachusetts, Amherst

Awarded for obtaining a semester GPA of 3.5 or greater in semesters with higher-level classes.

2022 - 2025

Chancellor's Award, University of Massachusetts, Amherst

Competitive scholarship awarded upon admission.

OUTREACH & SERVICE

2025

Astronomy On Tap - Western Massachusetts

Selected as the first undergraduate by the UMass Astronomy Department to present research at this global science outreach event hosted in local venues for public engagement.

2024

Astro Night, UMass Amherst

Led telescope demonstrations and interactive sessions for the general public at the Orchard Hill Observatory at UMass. Explained night sky objects and astrophysics concepts to visitors.

2023

Rocketry Demonstration for High Schoolers, Amherst

Organized and presented engaging hands-on water-rocketry demos and coding activities for high school students exploring propulsion physics and programming.

ADDITIONAL SKILLS

- Python, C++, MATLAB
- Astropy, NumPy, Matplotlib, PhotoUtils
- Aperture Photometry, FITS Image Processing
- SolidWorks, Fusion360
- Circuit Assembly, Robotics Prototyping
- Git, Linux, LaTeX

EXTRA CURRICULAR ACTIVITIES

May 2024 - May 2025

Left Winger, UMass SPS, Intramural Club Soccer

Played in the university's competitive intramural league, representing the UMass Amherst Society of Physics Students in seasonal tournaments.

May 2023 - Sept 2023

Technical Assistant, CNS Dean's Office

Conducted comprehensive hardware upgrades, including RAM and storage enhancements, on 30+ faculty computers, boosting system performance by 40% and extending the lifespan of existing equipment.

Feb 2023 - May 2023

Staff Member, UMass All-Campus Makerspace

Assisted over 70 students with electronics and prototyping projects; assembled and troubleshot circuits, designed 3D-printable models using CAD software, and maintained a fleet of 10+ 3D printers through regular servicing and calibration.

Sept 2022 - Aug 2023

Structure Team Lead, UMass Rocketry Club

Led rocket design and construction; oversaw 3D modeling, structural simulations, and team meetings, while coordinating project updates in weekly leadership briefings.

REFERENCES

Prof. Daniela Calzetti

Department of Astronomy, UMass Amherst calzetti@astro.umass.edu

Prof. Andrea Pocar

Department of Physics, UMass Amherst pocar@physics.umass.edu

Prof. Mauro Giavalisco

Department of Astronomy, UMass Amherst mauro@astro.umass.edu

Prof. Donald Candela

Department of Physics, UMass Amherst candela@physics.umass.edu