# 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**
*Independant 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/Independant 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**
*Independant 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* **Peer Mentor: Astronomy**
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**
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
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**Prof. Andrea Pocar**
Department of Physics, UMass Amherst
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**Prof. Mauro Giavalisco**
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**Prof. Donald Candela**
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