Daksh Bhatt

University of Massachusetts, Amherst
dakshbhatt@umass.edu, dakshbhatt.research@gmail.com | +91 96110 28770
www.dakshbhatt.in | ORCID: 0009-0009-2783-1131 | LinkedIn: DakshBhatt

EDUCATION

Expected Graduation: *Dec 2025* **University of Massachusetts, Amherst**
B.S. Astronomy & Physics
College of Natural Sciences & Commonwealth Honors College
Relevant Coursework:
Galaxies & Cosmology, Stellar Astrophysics, Observational Astronomy, Thermodynamics, Thermodynamics Lab, Quantum Mechanics, Classical Mechanics, Electricity & Magnetism, Statistical Mechanics, Computational Physics, Techniques of Theoretical Physics, Modern Physics, Ordinary Differential Equations, Multivariable Calculus, Linear Algebra, Writing About Astronomy, Astronomy in a Global Context.

RESEARCH EXPERIENCE

Feb 2025 – Present **Research Assistant, Calzetti Group, UMass Amherst**
Independant Study
PI: Dr. Daniela Calzetti

Investigating how dust attenuation systematically biases stellar age estimates in the M33 galaxy by calibrating multi-band photometry and comparing observations to theoretical attenuation models.

- Designed and wrote all custom Python pipelines for cross-instrument photometric calibration, including zero-point derivation and refinement to resolve calibration offsets between mosaic tiles and full drizzled frames.
- Performed multi-band photometry in Python using self-written routines; integrated attenuation models into color–color diagnostics to quantify dust-driven shifts in inferred stellar ages.
- Preliminary results show age overestimation consistent with attenuation geometry effects; manuscript in preparation (target submission: Spring 2026).

Jul 2025 – Nov 2025 **Research Assistant, Great Basin Observatory (GBO)**
Remote Research
PI: Mr. Jerry Hilburn

Conducted remote observational and computational research on candidate binary stars using GBO telescope data, the Washington Double Star Catalog, and Gaia DR3 to identify physically bound stellar systems.

- Reduced and analyzed telescope images in AstroImageJ, measuring separation and position angle for binary candidate WDS 20528+6307; compared results to 13 historical measurements to assess long-term orbital stability.
- Developed a Python pipeline using Gaia DR3 data to assess gravitational binding of star pairs, incorporating first-order energy tests, Monte Carlo propagation, and stellar parameter calibration for probabilistic classification.
- Authored a research paper on WDS 20528+6307 (under review at Journal of Double Star Observations) and preparing a second manuscript on the gravitational binding methodology (submission planned December 2025).

May 2024 – Dec 2024 **Research Assistant, nEXO, PocarGroup, UMass Amherst**
Full Time/Independant Study
PI: Dr. Andrea Pocar

Quantified optical systematics in large-scale simulation pipelines for the nEXO neutrinoless double beta decay experiment to improve reliability of photon transport modeling in liquid xenon (LXe) detectors.

- Modeled photon transport efficiency in LXe geometries using GPU-accelerated Chroma simulations, focusing on how surface representation impacts Silicon Photomultiplier light collection.
- Identified and quantified tessellation-driven artifacts from Computer-Aided Design (CAD) export settings; compared curved vs. flat reflector geometries and established reproducible simulation guidelines to reduce cross-institutional variance.
- Authored internal technical documentation adopted by the collaboration and presented results at the 2024 APS-DNP Conference.

Feb 2023 – May 2023 **Research Assistant, LUX-ZEPLIN, HertelGroup, UMass Amherst**
Independant Study
PI: Dr. Scott Hertel

Contributed to early-stage cryogenic hardware development for dark matter detection in support of the LUX-ZEPLIN (LZ) experiment, with a focus on low-heat, non-conductive actuation mechanisms.

- Designed and built a cryogenic mechanical switch to control detector hardware without adding thermal load or introducing conductive components into the low-temperature environment.
- Engineered a novel actuation system using repurposed ABS-based LEGO components for robust, non-conductive motion transfer suitable for cryogenic operation.
- Supported broader experimental development efforts within the LZ program, contributing to low-background instrumentation used in WIMP detection.

PUBLICATIONS

Nov 2025 **Astrometric Observations of WDS 20528+6307 Using the Great Basin Observatory**
Under peer review in the Journal of Double Star Observations.

This study presents new astrometric measurements of WDS 20528+6307 from Great Basin Observatory data compared with 40 years of archival records, finding minimal separation change (<1.1") but strong Gaia DR3 parallax and proper motion agreement, consistent with a common moving group or weakly bound binary.

RESEARCH PAPERS

Dec 2024 **Star Formation Rate in the First Billion Years: Insights from High-Redshift Galaxies**
Unpublished

Analyzed PRIMER survey data to investigate SFR–M* and sSFR–M* relations of massive galaxies ($M^* > 10^{10}$ $M_\odot$) across $0 < z < 14$, revealing higher star formation efficiency at $z > 6$ and feedback-driven quenching at lower redshifts.

Aug 2024 **Exploring Chroma Simulation Discrepancies: Comparative Analysis of CAD Geometries**
Unpublished

Investigated how CAD surface resolution and geometry variations affect optical simulations in Chroma, a GPU-based ray-tracing framework. Results informed simulation practices within the PocarGroup and the nEXO collaboration.

PRESENTATIONS

Oct 2024 **American Physics Society, Division of Nuclear Physics, Fall'24 Meeting**
Presented a first-author poster on optical simulation fidelity in LXe, showing how CAD surface tessellation affects photon transport and detector modeling in nEXO. [Abstract, Poster]

TEACHING EXPERIENCE

Feb 2025 – May 2025 **Teaching Assistant: PHYS281 - Computational Physics, UMass Amherst**
Supervisor: Dr. Shubha Tewari
Supported instruction for a 25-student course in Python-based scientific computing; assisted students with debugging, data analysis, and simulations during labs and office hours, and evaluated their code-based project work.

Sept 2024 – Dec 2024 **Teaching Assistant: PHYS131 - Introduction to Mechanics, UMass Amherst**
Supervisor: Dr. Heath Hatch
Assisted instruction for a 75-student introductory mechanics course; guided students through problem-solving during class and office hours, graded assignments and exams, and led review sessions to reinforce conceptual understanding.

Feb 2024 – May 2024 **Teaching Assistant: ASTRON105 - Weather and Astronomy, UMass Amherst**
Supervisor: Dr. 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, UMass Amherst**
Supervisor: Dr. Stephen Schneider
Assisted 50 first-year astronomy majors during lab sessions, helping students navigate Stellarium software and apply core astronomy concepts to night sky simulations..

OUTREACH & MENTORING EXPERIENCE

Sept 2025 **Astronomy On Tap - Bengaluru, India**
Introduced audiences to stellar nucleosynthesis and the cosmic origins of the elements, using stardust as an accessible narrative bridge between astrophysics and human connection.

May 2025 **Astronomy On Tap - Western Massachusetts, USA**
Selected as the first undergraduate from UMass Astronomy to present on star-formation rates in high-redshift galaxies, comparing evolutionary signatures of young and mature galaxy populations for a public audience.

May 2024 – Dec 2024 **Peer Mentor: Astronomy, UMass 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.

Nov 2024 **Astro Night, UMass Amherst**
Led public observing sessions on the Leonids meteor shower using the 16-inch Cassegrain at Orchard Hill Observatory, guiding 80 visitors through night-sky objects and related astrophysical concepts.

Nov 2023 **Rocketry Demonstration for High Schoolers, Amherst**
Organized and led hands-on water-rocketry demonstrations and introductory coding activities for 50 high school students, teaching propulsion physics and basic programming through interactive STEM outreach.

Feb 2023 – Aug 2023 **New Student Orientation Mentor, Rocketry Club, UMass 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

Oct 2024 **APS DNP Fall'24 Meeting, Boston, USA**
Awarded full travel, housing, and registration support by the American Physical Society to present research.

Fall'24, Spring'25 **Dean's List, UMass Amherst**
Awarded for obtaining a semester GPA of 3.5 or greater in semesters with higher-level courses.

Sept 2022 – Dec 2025 **Chancellor's Award, UMass Amherst**
Competitive scholarship awarded upon admission, covering approximately 40% of total tuition.

SOCIETIES & MEMBERSHIPS

- American Physical Society (APS)
- American Astronomical Society (AAS)
- Society of Physics Students (SPS)
- Astronomical Society of India (ASI)
- Indian Physics Association (IPA)
- nEXO collaboration

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, UMass Amherst**
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, All-Campus Makerspace, UMass Amherst**
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, Rocketry Club, UMass Amherst**
Led rocket design and construction; oversaw 3D modeling, structural simulations, and team meetings, while coordinating project updates in weekly leadership briefings.

ADDITIONAL SKILLS

- Python, C++, MATLAB
- Astropy, NumPy, Matplotlib, PhotoUtils
- Aperture Photometry, FITS Image Processing
- DS9, AstroImageJ, ASTAP
- SolidWorks, Fusion360
- Circuit Assembly, Robotics Prototyping
- Git, Linux, LaTeX

REFERENCES

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

Mr. Jerry Hilburn
Director, Great Basin Observatory
science@greatbasinfoundation.org

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

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

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

Dr. Scott Hertel
Department of Physics, UMass Amherst
shertel@umass.edu