KRITTI SHARMA

PhD Candidate in Astrophysics, California Institute of Technology
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EDUCATION

California Institute of Technology Pasadena, CA, USA
PhD in Astrophysics *2023-Present*
Advisor: Prof. Vikram Ravi
Thesis: "*Fast Radio Bursts: Cosmic Beacons Illuminating the Baryonic Matter in the Universe*"
Research Interests: I investigate the distribution of baryons to study the physics of galaxy formation, with the broader goal of constraining fundamental cosmological parameters. I combine complementary probes, including FRB dispersion measures, the kinematic Sunyaev-Zel'dovich effect, and galaxy populations, to decipher how baryons shape the underlying cosmic web and to mitigate baryonic uncertainties in next-generation cosmological analyses.

California Institute of Technology Pasadena, CA, USA
MS in Astrophysics *2022-2023*
Selected Coursework: Radiative Processes, Astrophysical Cosmology, Structure and Evolution of Galaxies, Interstellar and Intergalactic Medium, High-Energy Astrophysics, Structure and Evolution of Stars, Astronomical Measurements and Instrumentation, Fundamentals of Statistical Learning

Indian Institute of Technology Bombay Mumbai, MH, India
B.Tech in Mechanical Engineering with Honors, and Minor in Computer Science *2018-2022*
Advisors: Prof. Varun Bhalerao, Prof. Archana Pai
Theses: "*Convolutional Neural Network-based Algorithm for Detecting Intermediate-mass Black Hole Binaries in LIGO Data*" and "*Near-Earth Asteroid Observations and Data Reduction Software for GROWTH-India Telescope*"
Selected Coursework: Astrophysics, Special Theory of Relativity, Classical Mechanics, Quantum Physics, Electricity and Magnetism, Advanced Machine Learning, Intelligent & Learning Agents, Deep Learning, Programming for Data Science, Data Structures, Algorithms, Operating Systems, Differential Equations, Linear Algebra, Automatic Speech Recognition, Digital Image Processing

OBSERVING EXPERIENCE

W.M. Keck Observatory, Maunakea on Hawai'i *2022-Present*
27 nights (Co-I; PI: Ravi, Connor, Ocker) on LRIS, MOSFIRE, KCWI, DEIMOS, and ESI to build a complete catalog of 40+ Fast Radio Burst (FRB) host galaxies localized by Deep Synoptic Array.

Hale Telescope, Palomar Observatory *2022-2025*
16 nights (Co-I; PI: Ravi, Connor) on DBSP, NGPS, WaSP, and WIRC, to complement FRB host Keck observations.

GROWTH-India Telescope, Indian Astronomical Observatory *2020-2022*
50+ nights to follow up 70+ Asteroids, 30+ Comets, and 4 Gamma Ray Bursts, as a part of GROWTH collaboration.

RESEARCH PUBLICATIONS

Refereed publications: 32 (11 first authored; 4 second/third authored; 17 co-authored)
Non-refereed publications: 210 (1 AAS Research Note, 186 MPECs, 16 ATels, and 7 GCNs for discovery and follow-up observations of minor planets, comet outbursts, and Gamma Ray Burst afterglows)
Citations (all papers): 989
Citations (first author): 210
H index: 16

First-Author Papers

11. "*Baryons in the Darkest Sites of the Universe*"
K. Sharma, V. Ravi, D. Anbajagane, *et al.*, 2026, ApJL, 1006, L3. arXiv:2605.01994.
10. "*Backlighting the Cosmic Web with Fast Radio Bursts: An Anthology of Dispersion Measure Cross-Correlations with large-Scale Structure and Baryon Tracers*"
K. Sharma, E. Krause, V. Ravi, *et al.*, 2026, accepted in ApJ. arXiv:2604.22105.

9. "*Signatures of Suppressed Matter Clustering revealed by Fast Radio Bursts*"
K. Sharma, E. Krause, V. Ravi, *et al.*, 2026, accepted in Nature Astronomy. arXiv:2604.17162.
8. "*Quantifying the Impact of Selection Effects on FRB DM−z Relation Cosmological Inference*"
K. Sharma, V. Ravi, E. Krause, *et al.*, 2026, ApJ, 999, 202. arXiv:2511.16850.
7. "*Probing Baryonic Feedback and Cosmology with the $3\times2-$point Statistic of FRBs and Galaxies*"
K. Sharma, E. Krause, V. Ravi, *et al.*, 2026, ApJ, 998, 109. arXiv:2509.05866.
6. "*A Hydrodynamical Simulations-based Model that Connects the FRB DM−Redshift Relation to Suppression of the Matter Power Spectrum via Feedback*"
K. Sharma, E. Krause, V. Ravi, *et al.*, 2025, ApJ, 989, 81. arXiv:2504.18745.
5. "*Fast Luminous Extragalactic Transients in the VLA Sky Survey: Implications for the Rates of Accretion-induced Collapse Events, Fast Blue Optical Transients and Gamma Ray Burst Afterglows*"
K. Sharma, V. Ravi, D. Dong, *et al.*, 2025, PASP, 137, 084102. arXiv:2506.04522.
4. "*Preferential Occurrence of Fast Radio Bursts in Massive Star-forming Galaxies*"
K. Sharma, V. Ravi, L. Connor, *et al.*, 2024, Nature, 635, 61-66. arXiv:2409.16964.
3. "*Searching for Massive Black Hole Binaries with a Transfer Learning Algorithm*"
K. Sharma, K. Chandra, and A. Pai, 2023, Phys. Rev. D 108, 124061. arXiv:2208.02545.
2. "*Astreaks: Astrometry of NEOs with Trailed Background Stars*"
K. Sharma, H. Kumar, H. Choudhary, *et al.*, 2023, MNRAS, 524, 2, 2651-2660. arXiv:2306.16519.
1. "*A Massive Elliptical Host Among Two Galaxy-cluster Fast Radio Bursts*"
K. Sharma, J. Somalwar, C. Law, *et al.*, 2023, ApJ, 950, 175. arXiv:2302.14782.

Second/Third-Author Papers

4. "*A new measurement of the FRB DM-galaxy cross correlation and a first joint analysis with the kinematic SZ effect*"
S. McCarty, L. Connor, K. Sharma, *et al.* 2026, under review in PRD. arXiv:2608.11296.
3. "*Great Walls of Cosmic Baryons in the Northern Sky*"
V. Ravi, K. Sharma, and L. Connor, 2026, accepted in ApJL. arXiv:2604.05093.
2. "*A gas-rich cosmic web revealed by the partitioning of the missing baryons*"
L. Connor, V. Ravi, K. Sharma, *et al.*, 2025, Nature Astronomy, 9, 1226-1239. arXiv:2409.16952.
1. "*Deep Synoptic Array Science: First FRB and Host Galaxy Catalog*"
C. Law and K. Sharma, *et al.*, 2024, ApJ, 967, 29. arXiv: 2307.03344.

Papers with Supporting Contributions

17. "*Searching for Long Duration Radio Transients with the DSA-110*"
M. Sherman, N. Kosogorov, *et al.* (incl. K. Sharma), 2026, PASP, 138, 024501. arXiv:2510.18136.
16. "*A Luminous and Hot Infrared through X-Ray Transient at a 5 kpc Offset from a Dwarf Galaxy*"
J. Somalwar, V. Ravi, *et al.* (incl. K. Sharma), 2025, ApJ, 995, 228. arXiv:2505.11597.
15. "*Optical/Infrared Observations of the Extraordinary GRB 250702B: A Highly Obscured Afterglow in a Massive Galaxy Consistent with Multiple Possible Progenitors*"
J. Carney, I. Andreoni, *et al.* (incl. K. Sharma), 2025, ApJL, 994, L46. arXiv:2509.22784
14. "*A Correlation between Fast Radio Burst Dispersion Measure and Foreground large-scale Structure*"
M. Hussaini, L. Connor, *et al.* (incl. K. Sharma), 2025, ApJL, 993, L27. arXiv:2506.04186
13. "*Evidence for a Hot Galactic Halo around the Andromeda Galaxy Using FRBs along Two Sightlines*"
R. Anna-Thomas, C. Law, *et al.* (incl. K. Sharma), 2025, ApJ, 993, 221. arXiv:2503.02947.
12. "*A 50 Mpc Fast Radio Burst Constrains the Mass of the Milky Way Circumgalactic Medium*"
V. Ravi, M. Catha, *et al.* (incl. K. Sharma), 2025, AJ, 169, 330, arXiv:2301.01000.
11. "*The Palomar twilight survey of 'Ayló'chaxnim, Atiras, and comets*"
B. Bolin, F. Masci, *et al.* (incl. K. Sharma), 2025, Icarus, 425, 116333. arXiv:2409.15263.
10. "*Searching for magnetar binaries disrupted by core-collapse supernovae*"
M. Sherman, V. Ravi, *et al.* (incl. K. Sharma), 2024, MNRAS, 534, 2, 1414-1419. arXiv:2404.05135.

9. "*A Heavily Scattered Fast Radio Burst Is Viewed Through Multiple Galaxy Halos*"
J. Faber, V. Ravi, *et al.* (incl. K. Sharma), under review at ApJ. arXiv:2405.14182.
8. "*Polarimetry of 25 New Fast Radio Bursts Provides Insights into Their Origins*"
M. Sherman, L. Connor, *et al.* (incl. K. Sharma), 2024, ApJ, 964, 131. arXiv:2308.06813.
7. "*Characterizing the Ordinary Broad-line Type Ic SN 2023pel from the Energetic GRB 230812B*"
G. Srinivasaragavan, V. Swain, *et al.* (incl. K. Sharma), 2024, ApJL, 960, L18. arXiv:2310.14397.
6. "*Implications of Faraday Rotation Measures of Fast Radio Bursts Localized to Host Galaxies*"
M. Sherman, L. Connor, *et al.* (incl. K. Sharma), 2023, ApJL, 957, L8. arXiv:2308.06816.
5. "*Two Fast Radio Burst Sources in Massive Galaxy Clusters*"
L. Connor, V. Ravi, *et al.* (incl. K. Sharma), 2023, ApJL, 949, L26. arXiv:2302.14788.
4. "*Discovery of the Host Galaxy of FRB 20220912A*"
V. Ravi, M. Catha, *et al.* (incl. K. Sharma), 2023, ApJL, 949, L3. arXiv:2211.09049
3. "*India's First Robotic Eye for Time-domain Astrophysics: The GROWTH-India Telescope*"
H. Kumar, V. Bhalerao, *et al.* (incl. K. Sharma), 2022, AJ, 164, 90, arXiv:2206.13535.
2. "*Fast-transient Searches in Real Time with ZTFReST: Identification of Three Optically Discovered Gamma-Ray Burst Afterglows and New Constraints on the Kilonova Rate*"
I. Andreoni, M. Coughlin, *et al.* (incl. K. Sharma), 2021, ApJ, 918, 63. arXiv:2104.06352.
1. "*Time-series and Phase-curve Photometry of Active Asteroid Gault in a Quiescent State*"
J. Purdum, Z. Lin, , *et al.* (incl. K. Sharma), 2021 ApJL 911 L35. arXiv:2102.13017

HONORS AND AWARDS

- **Doug and Betty Nickerson Graduate Fellowship**, California Institute of Technology *2022-2023*
- **Undergraduate Research Award: Institute Academic Prize** in recognition of exceptional research during Bachelor's Thesis in Astronomy *2020-2022*
- **ASI New Discovery Award Special Mention** from the **Astronomical Society of India** (ASI) *2020*
- Achieved **99.99 Percentile** in **JEE-Advanced & Mains** national exams among 1M+ candidates *2018*

PRESS RELEASES AND SCIENCE JOURNALISM (*INTERVIEWED)

- American Astronomical Society (AAS) Nova research highlights, "*Diving into the Darkest Corners of the Universe with Fast Radio Bursts*".
- California Institute of Technology press release*, "*Mighty Radio Bursts Linked to Massive Galaxies*".
- Nature News and Views article*, "*Mysterious radio bursts mostly come from massive galaxies*".
- California Institute of Technology press release, "*Missing Matter in Universe Found*".
- Harvard University press release, "*A New GPS for the Intergalactic Medium: Astronomers Have Found the Home Address for Universe's "Missing" Matter*".
- IIT Bombay press release*, "*IITB students discover closest known asteroid to fly by Earth*".
- California Institute of Technology press release, "*ZTF Finds Closest Known Asteroid to Fly By Earth*".
- NASA JPL press release, "*Tiny Asteroid Buzzes by Earth - the Closest Flyby on Record*".
- European Space Agency (ESA) article, "*2020 QG, the closest close approach*".
- Forbes news article, "*Our Planet Protected Us. Earth 'Bends' An Asteroid Just 1,830 Miles Out, The Closest Flyby On Record*".

SCIENTIFIC WORKSHOPS AND TALKS

Invited Workshops

- Baryons @ Princeton, Princeton University *04/15/2026*
- Exploring New Boundaries in Cosmology and Astrophysics: CMB and LSS Surveys, Kavli Institute for Theoretical Physics (KITP), University of California Santa Barbara (UCSB) *02/12/2026*
- FTSky: A program in the field of Fast Radio Transients, International Center for Theoretical Sciences (ICTS), Tata Institute of Fundamental Research (TIFR) *10/08/2025*

Invited Talks

- Roman Collaboration Science Meeting, University of Arizona *06/12/2026*
- CRAFT Collaboration Science Meeting, Swinburne University of Technology *04/28/2026*
- Cosmology Seminar, Princeton University *03/19/2026*
- FRB 2025 Meeting, McGill University *07/08/2025*
- Observers Lunch, Northwestern University *05/23/2025*
- Astronomy-Cosmology-Gravity (ACG) Seminar, Department of Physics, IIT Bombay *05/07/2025*
- FRB Frontiers Meeting, University of Pittsburgh *03/03/2025*
- Coffee Talk and Cosmology Seminar, Princeton University *02/27/2025*
- Radio Lunch Seminar, California Institute of Technology *12/03/2024*
- Time Domain Astronomy Meeting, Northwestern University *18/07/2023*
- FRB 2023 Meeting, India *11/07/2023*
- Colloquia at TIFR, National Center for Radio Astrophysics, and IIT Bombay *11/03/2023*
- The Astrophysics of FRBs, Center for Computational Astrophysics, Flatiron Institute *09/11/2023*
- Open Compact Binary Coalescence Call, LIGO Scientific Collaboration LIGO-P2200227 *06/28/2022*

Contributed Talks

- American Astronomical Society, AAS Meeting #248, Pasadena *06/16/2026*
- New Synergies in Multi-Probe Cosmology, KITP, UCSB *02/06/2026*
- Cosmic Ecosystems Meeting, Perimeter Institute, University of Waterloo *08/01/2025*
- FRB 2024 Meeting, Thailand *11/04/2024*
- American Astronomical Society, AAS Meeting #243, New Orleans *01/10/2024*
- Scientific Frontiers and Synergies for the DSA-2000 Radio Camera Conference, Caltech *03/20/2023*
- 23rd International Conference on General Relativity and Gravitation (GR23) *07/07/2022*
- Europlanet Science Congress 2021, European Planetary Science Congress *09/13/2021*

Contributed Workshops

- New opportunities in Astronomy, Owens Valley Radio Observatory (OVRO), Bishop *05/13/2025*
- Multi-wavelength follow-up of FRBs in the era of routine localizations, Univ. of Toronto *04/25/2023*
- Pro-Am Comet Community Workshop, Europlanet Society, Stefanik Observatory, Prague *06/10/2022*
- Zwicky Transient Facility Summer School, California Institute of Technology *08/16/2021*
- Radio Astronomy Winter School, NCRA, TIFR and IUCAA *12/20/2020*
- Quantum Computing Workshop - an IBM Quantum Experience, IIT Bombay *07/01/2020*

RESEARCH MENTORSHIP EXPERIENCE

- Mariana Vale Taveira (Undergraduate Student, Caltech), *Resolving the star-formation history, metallicity, and interstellar media of FRB hosts with KCWI integral field spectroscopy* *2025-Present*
- Harsh Choudhary (Graduate Student, IITB), *Improving asteroid astrometry with Astreaks* *2022-2023*
- Vishwajeet Swain (Graduate Student, IITB), *GROWTH-India non-sidereal observations* *2021-2022*

LEADERSHIP & SERVICE

- **Peer Reviewer**, reviewed **10+** manuscripts for ApJ, ApJL, MNRAS, and JCAP, providing critical scientific feedback to support rigorous peer review and publication *2024-Present*
- **Graduate Student Interviewer**, Caltech Astronomy Graduate Program Admissions, interviewed prospective graduate students and contributed to holistic evaluation and admissions decisions *2026*
- **Graduate Student Representative**, coordinated with faculty and led the execution of department-wide Caltech Astronomy colloquia, facilitating departmental scientific exchange *2024-2026*
- **Lead Organizer**, Caltech Astronomy Prospective Graduate Student Visit, coordinated departmental programming and logistics for prospective graduate students visit *2024*
- **Graduate Student Mentor**, supported incoming graduate students in navigating the academic, professional, and community aspects of graduate life at Caltech *2024*

TEACHING & OUTREACH

- **Caltech Astronomy Outreach Volunteer**, Q&A panelist for star-gazing lecture *2025*
  - Engaged with the community and **communicated astronomy research** in an accessible way
  - Contributed to public science outreach through **interactive discussions and Q&A** on radio astronomy, the DSA-2000 survey, and the science of the night sky
- **Lecturer**, *FTSky: A program in the field of Fast Radio Transients Workshop*, ICTS-TIFR *2025*
  - Led an intensive **hands-on training session** on optical studies of FRB host galaxies, covering archival data mining, data reduction, galaxy morphology, and SED analysis
  - Designed and **delivered lectures/tutorials** on probabilistic host-galaxy association, optical spectroscopy, and SED modeling, **guiding 100+ students** through astronomical analysis workflows
- **Teaching Assistant of Graduate Level Courses**
  Conducted tutorials, graded assignments, mentored students and supported smooth course delivery
  - Ay124: *Structure and Evolution of Galaxies*, Prof. Phil Hopkins, Caltech *Winter 2024*
  - Ay121: *Radiative Processes*, Prof. Sterl Phinney, Caltech *Fall 2023*
  - PH556: *Astrophysics*, Prof. Varun Bhalerao, IIT Bombay *Spring 2021*
- **Maunakea Astroday Public Outreach Program Volunteer** *2024*
  Astronomer Community Engagement (ACE) Program, Caltech Optical Observatories
  - Introduced **elementary school students** to the fundamentals of UV, IR, and optical astronomy
  - Demonstrated the ability of IR in **probing dust obscured** content of star-forming galaxies
- **Lecturer**, *Scientific Computation & Mathematical Modeling Course*, IIT Bombay *Summer 2020*
  - Provided **hands-on Python training** to **250+ students** on solving scientific problems
  - Designed **course material** on numerical methods and algorithms for differential equations
- **Project Moderator**, *Summer of Science reading projects*, IIT Bombay *2020-2021*
  - Advised a group of **6 students**, guiding them for a three month long **reading project**
  - **Fostered active discussions** within the group by sharing resources on observational astronomy
- **Amatuer Astronomy Club Manager**, *Krittika, The Astronomy Club of IIT Bombay* *2019-2021*
  - Managed **10 conveners**, tending to a community of $\sim$100 at IITB and $\sim$**5,500 enthusiasts** online
  - Supervised **6 projects**, 2 week-long tutorials on **numerical computing** and 3-day workshops
  - Ideated **Team ANYmations** to generate scriptable scientific animations for publicity campaigns
  - Organized **institute-wide events** such as lectures, discussions, documentary screenings, and competitions such as **Astromania**, **Scientific Computation/Observation Planning** Championships
  - Sensitized enthusiasts to **astrophotography** by conducting night sky **observation sessions** and familiarized beginners with basic concepts of telescope handling and observation planning

TECHNICAL SKILLS

Relevant first-author publications demonstrating astrophysics expertise denoted with [.]

Astrophysics expertise	Hydrodynamical simulations analysis [6], multi-probe cosmological analyses [10, 11], Fisher forecasting [7], Bayesian modeling/statistical inference [9], ML/time-series analysis [3], astronomical software development [2], galaxy SED modeling [4, 1]
Languages	Advanced proficiency in Python, with experience in Git, C++, SQL and MATLAB
ML/AI Stack	PyTorch, TensorFlow, Keras, Scikit-Learn, XGBoost, OpenCV, SLURM

PROFESSIONAL REFERENCES

Dr. Vikram Ravi	Professor of Astronomy, Caltech	vikram@astro.caltech.edu
Dr. Elisabeth Krause	Professor of Astronomy, University of Arizona	krausee@arizona.edu
Dr. Jason X. Prochaska	Professor, University of California Santa Cruz	xavier@ucolick.org
Dr. Liam Connor	Assistant Professor of Astronomy, Harvard	liam.connor@cfa.harvard.edu
Dr. Simone Ferraro	Scientist, Lawrence Berkeley National Laboratory	sferraro@lbl.gov
Dr. Varun Bhalerao	Associate Professor, IIT Bombay	varunb@iitb.ac.in
Dr. Archana Pai	Associate Professor, IIT Bombay	archanap@iitb.ac.in