Kaustav Mitra

Curriculum Vitae

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Education

- **Ph.D., Astrophysics**, *Yale University*, thesis advisor: Frank C. van den Bosch 2025
- **M.Sc. & M.Phil., Astrophysics**, *Yale University (New Haven, CT, USA)* 2021
- **B.Sc. & M.Sc., Physics**, *Presidency University (Kolkata, India)* 2018

Selected Presentations ($\diamond\diamond \implies$ *invited talk*, $\circ \implies$ *contributed talk*, $* \implies$ *poster*)

- Variant of: **"Diffmetal: Self-consistent metallicity and abundance ratio evolution over cosmic time"**
  - $\circ$ AAS Meeting (248th), Pasadena, CA (USA). June 2026
  - $*$ OpenSkAI 2026, SkAI Institute, Chicago, IL (USA). Sept 2026
- Variant of: **"Differentiable forward-model of galaxy formation physics meets modern survey data"**
  - $\circ$ HSC Medium Band Survey workshop, Nagoya University (Japan). July 2026
  - $\circ$ AAS Meeting (248th), Pasadena, CA (USA). June 2026
  - $\diamond\diamond$ MockNYC Conference, Flatiron Institute / Simons Foundation, New York (USA). Jan 2026
  - $\circ$ Early Career Scientist Symposium, High Energy Phys., Argonne National Lab (USA). Jan 2026
- Variant of: **"Dynamical modelling of satellite galaxies to infer galaxy-halo connection and cosmology"**
  - $*$ Division of Dynamical Astronomy (DDA) Meeting (57th), Chicago, IL (USA). June 2026
  - $\diamond\diamond$ Astronomy Seminar, Department of Physics & Astronomy, Clemson University, (USA). Feb 2026
  - $\circ$ AAS Meeting (247th), Phoenix, AZ (USA). Jan 2026
  - $\diamond\diamond$ Galaxy Formation Talk, Academia Sinica (ASIAA), Taipei City (Taiwan). Feb 2025
  - $\diamond\diamond$ KIAA-PKU Seminar, Kavli Institute for Astronomy and Astrophysics, Beijing (China). Dec 2024
  - $\circ$ Santa Cruz Galaxy Workshop, University of California, Santa Cruz (USA). Aug 2024
  - $\circ$ N3AS Summer School in Multi-Messenger Astrophysics, UCSC, California, (USA). Aug 2022
  - $\circ$ 53$^{\text{rd}}$ annual meeting, Division on Dynamical Astronomy (DDA), CCA, NY (USA). April 2022
- Variant of: **"Disk-Jet connection in blazars: modelling radiative transfer in multi-zone turbulent jets"**
  - $\circ$ Advances in Astroparticle Physics & Cosmology, SINP, WB (India). Jan 2020
  - $\circ$ The 29$^{\text{th}}$ New England Regional Quasar/AGN Meeting, MIT Kavli Institute, MA (USA). May 2019
- **"Holography beam modelling of CHIME and off-centering calibration using Cyg-A data"**
  - $\circ$ CHIME collaboration workshop, University of Toronto (Canada). May 2019
- Variant of: **"Halo Occupation of Quasars: AGN Unification From a Cosmological Perspective"**
  - $\circ$ APS April meeting (Distinguished Student Fellowship), Columbus, OH (USA). April 2018
  - $\circ$ 36$^{\text{th}}$ meeting, Astronomical Society of India, Hyderabad (India). Feb 2018
- **"Inferring astrophysical formation channels of binary black holes from GW data"**
  - $\circ$ International Centre for Theoretical Sciences, Bengaluru (India). July 2017

Scholarships and Awards

1. 3 consecutive times awardee of Yale Dean's Colloquium fund, as the organiser of Yale cosmology seminar series. — 2022, 2023, 2024
2. 2nd prize winner of Yale 3-minute thesis (3MT) competition in the physical sciences division — 2023
3. American Physical Society Distinguished Student Fellowship — 2018
4. S. N. Bhatt Memorial Excellence Fellowship, for undergraduate summer research, at the International Centre for Theoretical Sciences (ICTS-TIFR), India. — June - Aug, 2017
5. Kishore Vaigyanik Protsahan Yojana (KVPY) scholarship, Department of Science and Technology, Government of India. — 2013 - 2018
6. DST-INSPIRE Fellowship, Department of Science and Technology, Government of India. — 2013
7. Jagadis Bose National Science Talent Search (JBNSTS) scholarship. — 2013

Teaching Experience

At Yale University

- **Teaching Assistantship in undergraduate courses**
  - Galaxies and the Universe (ASTR 120) *main instructor:* Robert Zinn — Spring 2021
  - Introduction to Observational Astronomy (ASTR 155) *main instructor:* Michael Faison — Fall 2019
  - Planets and Stars (ASTR 110) *main instructor:* Robert Zinn — Summer 2019
  - Galaxies and the Universe (ASTR 120) *main instructor:* Jeffrey Kenney — Spring 2019
  - Origins and the Search for Life in the Universe (ASTR 130) *main instructor:* Debra Fischer — Fall 2018

At Presidency University

- **Peer-teaching in M.Sc. astrophysics courses** (2017)
  - Sources of Gravitational Waves *(1 lecture)*
  - Physics of the Neutron Star and Pulsars *(2 lectures)*
  - Baryon Acoustic Oscillation *(1 lecture)*
  - Cosmological inflation *(2 lectures)*
  - Quasars and cosmology *(1 lecture)*
  - Boltzmann equation & the early universe *(1 lecture)*
- **Peer-teaching, B.Sc. particle physics course** (2016)
  - Dirac Equation, spin and antiparticles *(2 lectures)*
- **Peer-teaching, B.Sc. Astrophysics course** (2016)
  - Degeneracy pressure and white dwarf *(1 lecture)*
  - Press Schechter theory, spherical collapse *(1 lecture)*
- **Peer-teaching, B.Sc. Quantum Mechanics** (2016)
  - Heisenberg's Matrix Mechanics *(2 lectures)*
- **Junior-senior mentorship:** "FORTRAN 95" Teaching Instructor to B.Sc. 1st year students. — Fall 2015

Other Teaching Experiences

- **Teaching Instructor, Training Camp for International Astronomy Olympiad 2016**. Taught 2 lectures: "Extra-solar planets and planet-hunting techniques" and "Galaxies & AGN" — May 2016
- Physics tutor to a high-school student, Anubhab Dasgupta, who is now a Ph.D. student at University of California Santa Cruz. — May 2016 - June 2018

Outreach

Argonne Learning Center

- Teaching Python programming to high-school students in 'Coding for Science' workshop. — June 2026

Argonne Open House

- I was involved in planning, preparation, and organization of the public outreach events.
- I staffed the cosmology booth on both days of the 2-day event, engaging the public mostly with discussions of optical surveys [specifically highlighted DESI]. — June 2026

Public Talks

- Science In The News (Talks in public libraries, partnering with lifelong-learners' programs) 2024
  "**Ray tracing from computers to the cosmos**" (jointly with 2 computer science PhD students)
  - Essex library, 33 West Avenue, Essex, CT 06426 May 11^{th}
  - Mark Twain library, 439 Redding Road, Redding, CT 06896 May 21^{st}
  - Norwich public library, 368 Main St. Norwich, VT 05055 May 30^{th}
  - Schiller Shoreline Institute for Lifelong Learning, May 28^{th}
    Nathanael B. Greene Community Center 32 Church St, Guilford, CT 06437
- **"Using high-school physics to unlock the strangest mysteries of the universe"** (some variation of this)
  - 2 pedagogical classes for high school students from Connecticut (Yale Splash initiative). Nov 2023
  - 1 hour lecture, addressing high school students of St. Timothy's School, Maryland. March 2021
  - Yale Pathways to Science for high school students from Connecticut. (20 minute talk) June 2020
  - Open Labs Exploring Science week for middle and high school students of greater New Haven area. Feb 2020
- "What are stars made of?", Open Labs Science Cafe talk for middle and high school students. Oct 2020
- "How to weigh galaxies and why do we need to?", Astronomy on Tap, New Haven, CT (USA). Feb 2020

Leitner Family Observatory and Planetarium

- I have regularly presented planetarium shows at Yale's Leitner Family Observatory and Planetarium, and have led numerous stargazing sessions there during the public-nights, every Tuesdays. 2019, 2020

Professional Commitments and Leadership Roles

- Mentoring via DESI mentor-mentee program 2026
- Planning, organization, and presentation $\longrightarrow$ Argonne Open House 2026
- Judge: Chambliss Astronomy Achievement Student Awards, American Astronomical Societry. 2026
- Referee for ApJ and JCAP 2024 - Now
- Mentor on Project SHORT: a student-led non-profit organisation guiding students from underprivileged backgrounds, mostly from developing countries, on graduate school applications. 2022 - 2025
- I started the weekly Yale Cosmology Seminars and I was the main organizer for 2 years. 2022 - 2024
- PhD student interviewer in graduate student recruitment. 2022 - 2024
- Content Editor, Yale Department of Astronomy Newsletter. 2023
- Co-organizer of weekly Galaxy Lunch seminars, Yale Department of Astronomy. 2022 - 2023
- Graduate student representative in the prospective student webinar and information session. Nov 2022
- Served in the student panel for interviewing and evaluating shortlisted applicants in the departmental faculty hiring process. 2022
- Two times "Data tsar" at CHIME telescope (one responsible for monitoring the smooth running of the telescope) 2019 - 2020
- Student member of the American Physical Society and member of American Physical Society (APS) Forums On Graduate Student Affairs (FGSA) and Outreach and Engaging the Public (FOEP). 2017 - 2019
- Science communication and public outreach volunteer American Physical Society (APS) April meeting, Columbus, Ohio, USA. April 2018
- Member of scientific organising committee and session chair of astrophysics session Undergraduate physics symposium, Presidency University. April 2017
- Student Coordinator, 'Advanced School on Gravitational Waves', Presidency University December 2016

List of Publications

Refereed Papers

1. Arit Bala, **Kaustav Mitra**, Ritaban Chatterjee, (2026) "Multizone modelling of blazar jets: constraints from GeV-optical correlation and short-time-scale variability". MNRAS, 551(3), 1584, 13 pp.
2. **Kaustav Mitra**, Frank C. van den Bosch, Josephine Baggen, Johannes U. Lange, (in rev.) "BASILISK IV. No S_8 Tension with Satellite Kinematics". OJAp [in review]
3. **Kaustav Mitra**, Frank C. van den Bosch, (in rev.) "BASILISK III. Stress-testing the Conditional Luminosity Function model". OJAp [in review]
4. Josephine Baggen, Frank C. van den Bosch, **Kaustav Mitra**, (2026) "The Impact of Baryonic Effects on the Dynamical Masses Inferred Using Satellite Kinematics". OJAp, Vol 9.
5. J. Sebastian Monzon, Frank C. van den Bosch, **Kaustav Mitra** (2024). "Constraining the low mass end of the stellar halo mass relation with surveys of satellite galaxies". ApJ, Volume 976, Issue 2, id.197, 23 pp.
6. **Kaustav Mitra**, Frank C. van den Bosch, Johannes U. Lange, (2024) "BASILISK II. Improved constraints on the galaxy-halo connection from satellite kinematics in SDSS". MNRAS, 533(3), 3647-3675
7. Aritra Ghosh, et al., *including* **Kaustav Mitra** (2024). "Denser environments cultivate larger galaxies: a comprehensive study beyond the Local Universe with 3 million Hyper Suprime-Cam galaxies" 971(2), id.142, 23 pp.
8. Pieter van Dokkum, et al., *including* **Kaustav Mitra** (2023). "A Candidate Runaway Supermassive Black Hole Identified by Shocks and Star Formation in its Wake". ApJL, 946(2), 14 pp.
9. Saugata Barat, Ritaban Chatterjee, **Kaustav Mitra** (2022). "Locating the GeV emission region in the jets of blazars from months time-scale multiwavelength outbursts". MNRAS, 515(2), 1655-1662.
10. Aritra Kundu, Ritaban Chatterjee, **Kaustav Mitra**, Sripan Mondal (2022). "RMS-flux relation and disc-jet connection in blazars in the context of the internal shocks model". MNRAS, 510(3), 3688-3700.
11. Anwesh Majumder, **Kaustav Mitra**, Ritaban Chatterjee, C. Megan Urry, Charles Bailyn, Prantik Nandi (2019). "Physical inference from the γ-ray, X-ray, and optical time variability of a large sample of Fermi blazars". MNRAS, 490(1), 124-134.
12. Sagnick Mukherjee, **Kaustav Mitra**, Ritaban Chatterjee (2019). "The accretion disc-jet connection in blazars". MNRAS, 486(2), 1672-1680.
13. **Kaustav Mitra**, Suchetana Chatterjee, Michael A. DiPompeo, Adam D. Myers, Zheng Zheng (2018). "The Halo Occupation Distribution of obscured quasars: revisiting the unification model". MNRAS, 477(1), 45-55.

References

- Andrew P. Hearin (ahearin@anl.gov), staff scientist at Argonne National Lab (USA).
- Frank C. van den Bosch (frank.vandenbosch@yale.edu) faculty member, Yale University (USA).