

Curriculum Vitae

Shouvik Roy Choudhury

Distinguished Postdoctoral Fellow

Academia Sinica Institute of Astronomy and Astrophysics (ASIAA)

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RESEARCH OVERVIEW

I have expertise in **theoretical cosmology**, particularly in high-level statistical analysis of cosmological data, Bayesian inference of cosmological parameters, and Bayesian model comparison, **at the interface of theoretical particle physics and cosmology**. My research interests broadly include testing various cosmological models against cosmological datasets, and the fundamental cosmological aspects of **dark energy, dark matter, neutrinos, and inflation, and tension among cosmological datasets**.

RESEARCH EXPERIENCE

Distinguished Postdoctoral Fellow <i>Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), Taiwan</i>	3 July 2023 - present
Postdoctoral Fellow <i>Inter-University Centre for Astronomy and Astrophysics (IUCAA), India</i>	1 Aug 2022 - 28 Jun 2023
Institute Postdoctoral Fellow <i>Department of Physics, Indian Institute of Technology Bombay (IITB), India</i>	19 Feb 2020 – 22 July 2022
Senior Research Fellow <i>Department of Physics, Harish-Chandra Research Institute (HRI), India</i>	Aug 2016 – Feb 2020
Junior Research Fellow <i>Department of Physics, Harish-Chandra Research Institute (HRI), India</i>	Aug 2014 – July 2016

EDUCATION

PhD in Physics <i>Harish-Chandra Research Institute (HRI), Allahabad, India</i> Research area: Neutrino Cosmology Thesis advisor: Prof. Sandhya Choubey (KTH Royal Institute of Technology) Thesis Title: Neutrino Mass Bounds from Cosmology Defended on 29 Jan 2020. Degree awarded on 04 March, 2020.	Jan 2016 – Jan 2020
Masters in Physics <i>Harish-Chandra Research Institute (HRI), Allahabad, India</i> Final Grade: 83.5% . Rank: 1st in the class	Aug 2013 – Dec 2015
Bachelors in Electrical Engineering <i>Jadavpur University, Kolkata, India</i> Cumulative GPA: 8.5/10	Jul 2007 – Jun 2011

COLLABORATION MEMBERSHIP

CMB-S4 (next-generation ground-based cosmic microwave background experiment.) - supported by the US Department of Energy Office of Science and the National Science Foundation.

Currently, I am the only member from Taiwan.

SOFTWARE TOOLS AND SKILLS

1. **Cosmological software:** Extensive experience with popular Markov Chain Monte Carlo packages such as **CosmoMC** (expert user), **Cobaya** (expert user) and **Monte-Python** (upper intermediate user) for cosmological data analysis, along with Boltzmann code solvers like **CAMB** and **CLASS**. Experience in modifying CAMB and CosmoMC to include new physics, and parameters. Experience in using **CosmoChord** (CosmoMC+Polychord) (expert user) for nested sampling and calculation of Bayesian evidences for model comparison.
2. **High Performance Computing:** Job management in HRI-HPC (<http://www.hri.res.in/cluster/>) at Harish-Chandra Research Institute, Spacetime HPC at IIT Bombay (<https://spacetime.iitb.ac.in/>), Grendel-Slurm (<http://www.cscaa.dk/grendel-s/>) at Aarhus University, and Tiara (<https://hpc.tiara.sinica.edu.tw/>) at Academia Sinica Institute of Astronomy and Astrophysics.
3. **Machine Learning:** Beginner.
4. **N-body Simulation:** Beginner in the usage of the COsmological N-body CodE in PyThon (**CONCEPT**), which also includes massive neutrinos in the simulation along with matter.
5. **Programming:** Python, C, C++, Fortran, Bash.
6. **Operating systems:** Windows, Linux (Ubuntu)
7. **Others Tools:** Mathematica, Gnuplot, Git, Vi, MPI, OpenMP, L^AT_EX

AWARDS AND HONOURS

- Received the **India Top Cited Paper Award 2024 from IOP Publishing** in the Astronomy and Astrophysics category for the paper titled "Updated constraints on massive neutrino self-interactions from cosmology in light of the H_0 tension" (published in JCAP).
- **Distinguished Postdoctoral Fellowship** from Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), Taiwan, with a research grant of 8000 USD per year for 2 years.
- Received the **India Top Cited Paper Award 2021 from IOP Publishing** in the Astronomy and Astrophysics category for the paper titled "Updated bounds on sum of neutrino masses in various cosmological scenarios" (published in JCAP). Note that this is the very first paper I wrote as a Ph. D. student.
- Received the **HRI-INFOSYS Prize** for distinction in research in particle physics (15 Aug, 2018).
- **Senior Research Fellowship** provided by Harish-Chandra Research Institute, India (Aug 2016 – Feb 2020), funded by Department of Atomic Energy (DAE).
- **Junior Research Fellowship** provided by Harish-Chandra Research Institute, India (Aug 2014 – Jul 2016), funded by Department of Atomic Energy (DAE).
- **Ranked 16** (within all of India) in CSIR-UGC **National Eligibility Test (NET)** exam in Physics (June 2015).
- **Ranked 67 (97.88 percentile)** (within all of India) in Joint Entrance Screening Test (**JEST-2013**).
- **PhD admission offer (Fall 2013)** with full financial support through Teaching Assistantship (TA) provided by Arizona State University, USA. **GRE Physics: 900/990** (2011).

- Ranked 305 among approx 87000 students (99.65 percentile) who appeared for the West Bengal Joint Entrance Examination (WBJEE) for Engineering & Technology in 2007.

PUBLICATIONS [INSPIRE](#) [NASA-ADS](#) [Google Scholar](#)

Statistics Summary: Total 11 published journal papers, and 1 conference praper (#7 below). I have made first author contributions and am the corresponding author of # 1-5,7, 9, and 11-12 in the list below (total 9).

Citations: 548 ([INSPIRE](#)), 462 ([NASA-ADS](#)), 576 ([Google Scholar](#)); and h-index: 10.

The bottom-most paper in the list (which was also my first paper) has been cited 124 times (as per [INSPIRE](#)), and for this paper, I received the India Top Cited Paper Award 2021 from IOP Publishing. I also received the India Top Cited Paper Award 2024 from IOP Publishing for #5 which has been cited 89 times.

12. [Shouvik Roy Choudhury](#), Tepei Okumura, “Updated cosmological constraints in extended parameter space with Planck PR4, DESI BAO, and SN: dynamical dark energy, neutrino masses, lensing anomaly, and the Hubble tension”, *2024 ApJL* **976 L11**, [arXiv: 2409.13022](#). Citations: 8
11. Nilay Bostan, [Shouvik Roy Choudhury](#), “First constraints on non-minimally coupled Natural and Coleman-Weinberg inflation and massive neutrino self-interactions with Planck+BICEP/Keck”, *JCAP* **07 (2024) 032**, [arXiv: 2310.01491](#). Citations: 11
10. Ruchika, Himansh Rathore, [Shouvik Roy Choudhury](#), Vikram Rentala, “A gravitational constant transition within cepheids as supernovae calibrators can solve the Hubble tension”, *JCAP* **06 (2024) 056**, [arXiv: 2306.05450](#). Citations: 16
9. [Shouvik Roy Choudhury](#), Steen Hannestad, Thomas Tram, “Massive neutrino self-interactions and inflation”, *JCAP* **10 (2022) 018**; [arXiv:2207.07142](#). Citations: 23
8. Stefano Gariazzo, Martina Gerbino, Thejs Brinckmann, Massimiliano Lattanzi, Olga Mena, Thomas Schwetz, [Shouvik Roy Choudhury](#), Katherine Freese, Steen Hannestad, Christoph A. Ternes, Mariam Tórtola, “Neutrino mass and mass ordering: No conclusive evidence for normal ordering”, *JCAP* **10 (2022) 010**; [arXiv:2110.00014](#). Citations: 48
7. [Shouvik Roy Choudhury](#), Steen Hannestad, Thomas Tram, “Massive Neutrino Self-interactions and The Hubble Tension”, *Journal of Physics: Conference Series*, Conference: **Topics in Astroparticle and Underground Physics 2021**. Citations: 3
6. Azadeh Moradinezhad Dizgah, Garrett K. Keating, Kirit S. Karkare, Abigail Crites, [Shouvik Roy Choudhury](#), “Neutrino Properties with Ground-Based Millimeter-Wavelength Line Intensity Mapping”, *2022 ApJ* **926 137**; [arXiv:2110.00014](#). Citations: 30
5. [Shouvik Roy Choudhury](#), Steen Hannestad, Thomas Tram, “Updated constraints on massive neutrino self-interactions from cosmology in light of the H_0 tension”, *JCAP* **03 (2021) 084**; [arXiv:2012.07519](#). Citations: 89
4. [Shouvik Roy Choudhury](#) and Steen Hannestad, “Updated results on neutrino mass and mass hierarchy from cosmology with Planck 2018 likelihoods”, *JCAP07(2020)037*; [arXiv:1907.12598](#). Citations: 138
3. [Shouvik Roy Choudhury](#) and Sandhya Choubey, “Constraining light sterile neutrino mass with the BICEP2/Keck Array 2014 B-mode polarization data”, *Eur.Phys.J. C* **79 (2019) no.7, 557**; [arXiv:1807.10294](#). Citations: 27
2. [Shouvik Roy Choudhury](#) and Abhishek Naskar, “Bounds on Sum of Neutrino Masses in a 12 Parameter Extended Scenario with Non-Phantom Dynamical Dark Energy ($w(z) \geq -1$)”, *Eur. Phys. J. C* (2019) **79: 262**; [arXiv:1807.02860](#). Citations: 31
1. [Shouvik Roy Choudhury](#) and Sandhya Choubey, “Updated Bounds on Sum of Neutrino Masses in Various Cosmological Scenarios”, *JCAP* **1809 (2018) no.09, 017**; [arXiv:1806.10832](#). Citations: 124

The citations for individual papers are quoted from [INSPIRE](#).

LANGUAGE SKILLS

- **English:** Fluent (**TOEFL: 109/120** in 2013, **GRE: 324/340** in 2011). **Bengali:** Native. **Hindi:** Fluent.

REFEREE WORK IN JOURNALS

1. Referee for Journal of High Energy Physics (JHEP), Journal of Cosmology and Astroparticle Physics (JCAP), Monthly Notices of the Royal Astronomical Society (MNRAS), and Journal of High Energy Astrophysics (JHEAP).

TEACHING EXPERIENCE

- Teaching assistant of **General Relativity** (instructor: Prof. Vikram Raval) for Bachelors, Masters, and Ph.D. students (January-May 2022), at IIT Bombay.
- Teaching assistant of **General Relativity** (instructor: Prof. Dileep Jatkar) for Physics Masters students (August-December 2017), at HRI.
- Teaching assistant of **Numerical Methods** (instructor: Dr. Rudra Banerjee) for Physics Masters students (January-May 2019), at HRI.

TALKS

1. *Cosmology in an extended parameter space: new constraints with DESI BAO*, **Kashiwa-no-ha Dark Matter and Cosmology Symposium**, Kavli IPMU, Kashiwa-no-ha, Japan, November 2024.
2. **(Invited)** *Probing Particle Physics Frontiers with CMB S4: Unveiling Cosmic Secrets*, **PPC 2024: XVII International Conference on Interconnections between Particle Physics and Cosmology**, IIT Hyderabad, India, October 2024. (Talk given on behalf of CMB-S4 collaboration)
3. **(Invited)** *Neutrino Cosmology*, **School of Physical Sciences, Jawaharlal Nehru University**, New Delhi, India, October 2024.
4. **(Invited)** *Cosmology in an extended parameter space: new constraints on dark energy and neutrino masses with DESI BAO*, **Indian Institute of Science (IISc)**, Bengaluru, India, September 2024.
5. **(Invited)** *Cosmology in an extended parameter space: new constraints on dark energy and neutrino masses with DESI BAO*, **Raman Research Institute**, Bengaluru, India, September 2024.
6. *Neutrino mass and mass ordering: no conclusive evidence for normal ordering*, **Cosmology from Home 2024**, June 2022.
7. *Massive Neutrino Self-interactions and the Hubble Tension*, **The Future is Flavourful**, National Tsing Hua University (NTHU), Hsinchu, June 2024.
8. *Neutrino Self-interactions in Cosmology*, **Neutrinos from Home 2024**, May 2024.
9. **(Invited)** *Neutrinos in Cosmology*, **Indian Statistical Institute**, Kolkata, India, April 2024.
10. **(Invited)** *Neutrinos in Cosmology*, **ICTS-TIFR**, Bengaluru, India, April 2024.
11. **(Invited)** *Massive Neutrino Self-interactions and the Hubble Tension*, **Raman Research Institute**, Bengaluru, India, April 2024.
12. *Massive Neutrino Self-interactions and the Hubble Tension*, **Gravitation and Cosmology 2024**, Yukawa Institute of Theoretical Physics (YITP), Kyoto, Japan, Feb 2024.

13. **(Invited)** *Massive Neutrino Self-interactions and the Hubble Tension*, **2023 NCTS Annual Theory Meeting**, Taipei, Taiwan, Dec 2023.
14. **(Invited)** *Massive Neutrino Self-interactions and the Hubble Tension*, **Institute of Physics, Academia Sinica**, Taipei, Taiwan, Dec 2023.
15. *First constraints on Non-minimally coupled Natural and Coleman-Weinberg inflation in the light of massive neutrino self-interactions and Planck+BICEP/Keck*, **Large-scale Parity Violation Workshop**, Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), Taipei, Taiwan, Dec 2023.
16. **(Invited)** *Neutrinos in Cosmology*, **Indian Institute of Science (IISc)**, Bengaluru, India, July 2023.
17. **(Invited)** *Neutrino Self-Interactions. Hubble Tension, and Inflation*, **Harish-Chandra Research Institute (HRI)**, Prayagraj (Allahabad), India, May 2023.
18. *Neutrino Self-Interactions. Hubble Tension, and Inflation*, **Largest Cosmological Surveys and Big Data Science**, ICTS-TIFR, Bengaluru, India, May 2023.
19. **(Invited)** *Neutrino Self-Interactions. Hubble Tension, and Inflation*, **Majorana-Raychaudhuri Seminar**, joint venture of INFN & University Salerno, Italy & PAMU, Indian Statistical Institute, Kolkata, India, April 2023.
20. *Massive Neutrino Self-Interactions and Inflation*, **Less Travelled Path to the Dark Universe**, ICTS-TIFR, Bengaluru, India, Mar 2023.
21. *Neutrino Self-Interactions. Hubble Tension, and Inflation*, **CERN Neutrino Platform Pheno Week 2023**, Geneva, Switzerland, Mar 2023.
22. **(Invited)** *Neutrinos in Cosmology*, **Academia Sinica Intitute of Astronomy and Astrophysics (ASIAA)**, Taipei, Taiwan, Feb 2023.
23. *Massive Neutrino Interactions and Inflation*, **Dark Side of the Universe DSU 2022**, UNSW Sydney, Australia, Dec 2022.
24. *Neutrino Self-interactions, Hubble Tension, and Inflation*, **Cosmology from Home 2022**, July 2022.
25. *Massive Neutrino Self-interactions and The Hubble Tension*, **Topics in Astroparticle and Underground Physics (TAUP) 2021**, Valencia, Spain, Aug 2021.
26. *Massive Neutrino Self-interactions and The Hubble Tension*, **Phenomenology 2021 Symposium, University of Pittsburgh**, Pittsburgh, United States, May 2021.
27. *Updated Constraints on the Massive Neutrino self-interactions in light of the Hubble tension*, **A (Hubble) Tension Headache, University of Southampton**, United Kingdom, March 2021.
28. *Strong Neutrino self-interactions and the Hubble tension*, **TMCC2021, Shahid Beheshti University**, Feb, 2021.
29. **(Invited)** *Neutrinos in cosmology*, **Institute of Mathematical Sciences**, Chennai, India, Jan 2021.
30. *Neutrino mass and mass hierarchy from cosmology*, **UChicago-2020: Cosmology with CMB-S4**, August 2020
31. *Neutrinos in cosmology: mass and mass hierarchy*, **CosmoGold IAP 2019, Institut Astrophysique de Paris**, Paris, France, June, 2019.
32. **(Invited)** *Neutrino masses in cosmology*, at **Tata Institute of Fundamental Research**, Mumbai, India, April, 2019.
33. **(Invited)** *Constraints on Neutrino Masses from Cosmology*, at **Aarhus University**, Aarhus, Denmark, November, 2018.

CONFERENCES, WORKSHOPS, AND SCHOOLS ATTENDED

1. **Kashiwa-no-ha Dark Matter and Cosmology Symposium**, 28 October - 1 November 2024, Kashiwa-no-ha, Japan.
2. **COSMO'24**, 21-25 October 2024, Kyoto, Japan.
3. **PPC 2024: XVII International Conference on Interconnections between Particle Physics and Cosmology**, 14-18 October 2024, Hyderabad, India.
4. **Cosmology from Home 2024**, 17-28 June 2024.
5. **The Future is Flavourful**, Hsinchu, Taiwan, 4-6 June 2024.
6. **Neutrinos from Home 2024**, 23 April - 1 May, 2024.
7. **Gravitation and Cosmology 2024**, Kyoto, Japan, 5-9 Feb 2024.
8. **2023 NCTS Annual Theory Meeting**, Taipei, Taiwan, 15-17 Dec 2023.
9. **Large-scale Parity Violation Workshop**, Taipei, Taiwan, 4-7 Dec 2023.
10. **Largest Cosmological Surveys and Big Data Science**, Bengaluru, India, 09-12 May 2023.
11. **Less Travelled Path to the Dark Universe**, Bengaluru, India, 13-24 Mar 2023.
12. **32nd meeting of Indian Association for General Relativity and Gravitation (IAGRG32)**, Kolkata, India, 19-21 Dec 2023.
13. **Dark Side of the Universe DSU 2022**, Sydney, Australia, 05-09 Dec 2022.
14. **Cosmology from Home 2022**, 04-15 July, 2022.
15. **ICTP Summer School on Cosmology 2022**, Trieste, Italy, 04-15 July, 2022.
16. **Topics in Astroparticle and Underground Physics (TAUP) 2021**, Valencia, Spain, 26 Aug - 03 Sep, 2021.
17. **Phenomenology 2021 Symposium**, Pittsburgh, USA, 24-26 May, 2021.
18. **A (Hubble) Tension Headache**, Southampton, United Kingdom, 1-3 March, 2021.
19. **Tehran Meeting on Cosmology at the Crossroads 2021**, Iran, 22-25 Feb, 2021.
20. **Physics of the Early Universe - An Online Precursor**, Bengaluru, India, 31 August 2020 - 03 September 2020.
21. **UChicago-2020: Cosmology with CMB-S4**, 10-14 August, 2020.
22. **CosmoGold IAP 2019 The golden age of cosmology from Planck to Euclid**, Paris, France, 24-28 June, 2019.
23. **SANGAM @ HRI 2018**, Allahabad, India, 5-9 March, 2018.
24. **Nu HoRIZons VII**, Allahabad, India, 21-23 February, 2018.
25. **Post-Planck Cosmology: Enigma, Challenges and Visions**, Pune, India, 9-12 October, 2017.
26. **Invisibles17 Workshop**, Zurich, Switzerland, 12-16 June, 2017.
27. **Invisibles17 School**, Murten, Switzerland, 6-10 June, 2017.
28. **SERC School in Theoretical High Energy Physics**, Kalyani, India, 9-28 January, 2017.
29. **Nu HoRIZons VI**, Allahabad, India, 17-19 March, 2016.
30. **SANGAM @ HRI 2016**, Allahabad, India, 15-19 February, 2016.

ORGANIZATION OF CONFERENCES AND WORKSHOPS

1. A member of the organizers of the instructional workshop in particle physics, SANGAM @ HRI 2016 and 2018 held at HRI, Allahabad.
2. A member of the organizers of the conference on neutrino physics, Nu HoRIzons VII (2018) and Nu HoRIzons VI (2016), held at HRI, Allahabad, India.

ACADEMIC VISITS

1. 29 September - 6 October 2024, **Jawaharlal Nehru University**, New Delhi, India, with Prof. Poonam Mehta.
2. 22 - 29 September 2024, **Raman Research Institute**, Bangalore, India, with Prof. Shiv Sethi.
3. 14 - 28 April 2018, **Indian Statistical Institute**, Kolkata, India, with Prof. Supratik Pal.
4. 7 - 14 April 2024, **ICTS-TIFR**, Bangalore, India, with Prof. Rajesh Gopakumar.
5. 31 March - 7 April 2024, **Raman Research Institute**, Bangalore, India, with Prof. Shiv Sethi.
6. 4 June - 6 July 2019, **Aarhus University**, Aarhus, Denmark, with Prof. Steen Hannestad.
7. 27 October - 29 November 2018, **Aarhus University**, Aarhus, Denmark, with Prof. Steen Hannestad.
8. 31 August - 17 September 2018, **Indian Statistical Institute**, Kolkata, India, with Dr. Ujjaini Alam.