Dr. Hrishikesh Chakrabarty

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PRINCIPAL INTERESTS

My research is focused on Gravity, its classical and quantum aspects. Currently I am involved in two principal directions in this field.

- Primordial cosmology with models of inflation, bounce and contact with observation.
- Phenomenological implications of singularity resolution in theories beyond general relativity, regular black holes and tests of gravity.

EMPLOYMENT HISTORY

Postdoctoral Research Fellow 2022 - present
Nazarbayev University, Astana, Kazakhstan
- Research on *Tests of gravity; inflationary and bouncing cosmologies.*

Research Fellow (Remote) 2021 - 2022
University of Chinese Academy of Sciences, Beijing, PR China
- Recipient of Special Research Assitant fellowship

Assistant Professor (part-time) 2021 - 2022
Jorhat Engineering College, Assam Science & Technology University, Assam, India
- Taught undergraduate physics courses.

Postgraduate Teacher 2017
Army Public School Tezpur, India
- Taught high-school physics and prepared the students for competitive exams.

Ad-hoc Lecturer 2016
Darrang College Tezpur, India
- Taught two undergraduate courses to honours students in physics.

ACADEMIC BACKGROUND

Doctor of Natural Science in Theoretical Physics 2020
Fudan University, Shanghai, PR China
- Doctoral research in resolution of gravitational singularities and tests of gravity under the direction of Prof. Cosimo Bambi.
- Dissertation: Singularity resolution in theories beyond General Relativity and some astrophysical implications.

M.Sc (Five years integrated) in Physics 2016
Tezpur University, Tezpur, India
- Specialization: Astrophysics and Cosmology
- Dissertation: Inflationary Cosmology: A Study on Starobinsky and Higgs Model
- Supervisors: Dr. Debasish Borah, Dr. Amit Pathak

Higher Secondary 2011
Darrang College, Tezpur, India

OTHER RESEARCH EXPERIENCE

Visiting Research Fellow Summer, 2015
Harish-Chandra Research Institute (HRI), Prayagraj, India
I worked on a reading project titled "A Study of Magnetohydrodynamic Structure of Accretion Disc" under the guidance of Prof. Tapas Das. During this stay at HRI, I presented my work to the astrophysics group members over four classroom style lectures.

Visiting Research Fellow Winter, 2014
Harish-Chandra Research Institute, Prayagraj, India
I worked on a reading project titled "Hydrodynamic Study of Accretion Disc: Shakura-Sunyaev Solution" and "Acoustic black holes" under the guidance of Prof. Tapas Das. During my stay at HRI, I presented my work to the astrophysics group members over two classroom style lectures.

Summer Research Fellow Summer, 2013
UM-DAE Center for Excellence in Basic Sciences (UM-DAE CEBS), Mumbai, India
At UM-DAE CEBS, I worked on spinning test particles in general relativity and modified gravity under the guidance of Dr. Tapan Naskar.

JOURNAL ARTICLES

See also my iNSPIREhep page. Citations: 230, h-index: 7 as of August 28, 2025.
Published:

13. A. Urmanov, **H. Chakrabarty** and D. Malafarina, "Observational properties of regular black holes in asymptotic safety," Eur. Phys. J. C **85**, no.6, 642 (2025), arXiv:2504.12072 [gr-qc].
12. A. Zholdasbek, **H. Chakrabarty**, D. Malafarina and A. Bonanno, "Emergent cosmological model from running Newton constant," Phys. Rev. D **111**, no.10, 103519 (2025), arXiv:2405.02636 [gr-qc].
11. D. Shadykul, **H. Chakrabarty** and D. Malafarina, "Intermediate mass ratio inspirals in dark matter halos," Phys. Rev. D **111**, no.10, 104003 (2025), arXiv:2410.18657 [gr-qc].
10. M. Alloqulov, **H. Chakrabarty**, D. Malafarina, B. Ahmedov and A. Abdujabbarov, "Gravitational lensing of neutrinos in parametrized black hole spacetimes," JCAP **02**, 070 (2025), arXiv:2408.12916 [gr-qc].
9. A. Urmanov, **H. Chakrabarty** and D. Malafarina, "Observational properties of coherent quantum black holes," Phys. Rev. D **110** (2024) no.4, 044030, arXiv:2406.04813 [gr-qc].
8. **H. Chakrabarty**, A. Chatrabhuti, D. Malafarina, B. Silasan and T. Tangphati, "Effects of gravitational lensing by Kaluza-Klein black holes on neutrino oscillations," JCAP **08** (2023), 018, arXiv:2302.01564 [gr-qc].
7. **H. Chakrabarty** and Y. Tang, "Constraining deviations from spherical symmetry using γ-metric," Phys. Rev. D **107** (2023) no.8, 084020, arXiv:2204.06807 [gr-qc].
6. **H. Chakrabarty**, D. Borah, A. Abdujabbarov, D. Malafarina and B. Ahmedov, "Effects of gravitational lensing on neutrino oscillation in γ-spacetime," Eur. Phys. J. C **82**, no.1, 24 (2022), arXiv:2109.02395 [gr-qc].
5. K. Jusufi, M. Jamil, **H. Chakrabarty**, Q. Wu, C. Bambi and A. Wang, "Rotating regular black holes in conformal massive gravity," Phys. Rev. D **101**, no.4, 044035 (2020), arXiv:1911.07520 [gr-qc].

4. **H. Chakrabarty**, A. Abdujabbarov, D. Malafarina and C. Bambi, "A toy model for a baby universe inside a black hole," Eur. Phys. J. C **80** (2020) no.5, 373, arXiv:1909.07129 [gr-qc].
3. **H. Chakrabarty**, A. Abdujabbarov, C. Bambi, "Scalar perturbations and quasi-normal modes of a nonlinear magnetic-charged black hole surrounded by quintessence," Eur. Phys. J. C **79**, no.3, 179 (2019), arXiv:1811.02847 [gr-qc].
2. **H. Chakrabarty**, A. Abdikamalov, A. Abdujabbarov, C. Bambi, "Weak gravitational lensing: a compact object with arbitrary quadrupole moment immersed in plasma," Phys. Rev. D **98** (2018) no.2, 024022, arXiv:1804.00461 [gr-qc].
1. **H. Chakrabarty**, C. A. Benavides-Gallego, C. Bambi, L. Modesto, "Unattainable extended spacetime regions in conformal gravity," JHEP **03** (2018), 013, arXiv:1711.07198 [gr-qc].

Submitted:

2. D. Malafarina, **H. Chakrabarty** and I. Musco, "How to obtain slow roll inflation driven by non-linear electrodynamics," arXiv:2503.19679 [gr-qc].
1. T. Zhumabek, A. Mukhamediya, **H. Chakrabarty** and D. Malafarina, "Running gravitational constant induced dark energy as a solution to σ_8 tension," arXiv:2411.05965 [astro-ph.CO].

SPECIAL ACHIEVEMENTS

Awards

- *Special Research Assistant Fellowship* for postdoctoral research
  Awarded by Chinese Academy of Sciences, People's Republic of China, 2020
- *Chinese Government Scholarship* for doctoral studies
  Awarded by the Government of People's Republic of China, 2017
- *Space Science Promotion Scheme Scholarship* for postgraduate studies
  Awarded by Indian Space Research Organization, ISRO, 2015
- *Summer/winter Research Fellowship* for research visit
  Awarded by Harish-Chandra Research Institute, Allahabad, 2014-2015
- *Summer Research Fellowship* for research visit
  Awarded by UM-DAE Center for Excellence in Basic Sciences, Mumbai, 2013
- *Anundaram Barua Award* for securing first class in HSLC examinations
  Awarded by the Government of Assam, 2009

Invited Talks (selection)

- Quasi-de Sitter expansion in asymptotically safe cosmology
  YITP long-term workshop on Gravity and Cosmology 2024, Yukawa Institute of Theoretical Physics, Kyoto University, Kyoto, January-March 2024.
- Black hole bounce and birth of a baby universe
  14th International Conference on Gravitation, Astrophysics and Cosmology, National Central University, Taiwan, August-2020
- Non-singular gravitational collapse and baby universe
  Astrophysics group seminar, Nazarbayev University, November-2019
- Non-singular gravitational collapse and baby universe
  Department seminar, Zhejiang University of Technology, Hanghzhou, October-2019

- Gravitational collapse and baby universes
  Department seminar, Indian Institute of Technology, Guwahati, August-2019
- Avoiding singularities in conformal gravity
  Asian-Pacific Winter School and Workshop on Gravitation and Cosmology, Yukawa institute for theoretical physics, February-2019
- Powerlaw Extension of Higgs and Starobinsky Inflation
  North-East Meet of Astronomers-II, Tezpur University, December-2016
- Acoustic Blackholes: Propagation of Acoustic Disturbances in A Inhomogeneous Flowing Fluid.
  North-East Meet of Astronomers, Tezpur University, November-2015

TEACHING

- *Classical Mechanics and Quantum Mechanics* *2021-22*
  To undergraduate students of Jorhat Enineering College, ASTU
- *Classical Mechanics* *2016*
  To third year honors students of Darrang College, Gauhati University
- *Mathematical Physics* *2016*
  To second year honors students of Darrang College, Gauhati University
- *High-school Physics* *2017*
  To high-school students of Army Public School, Tezpur

STUDENT SUPERVISION

Current.

2. Abdybek Urmanov, a PhD student of my collaborator Prof. Daniele Malafarina of Nazarbayev University on a project involving black hole shadows.
1. Mirzabek Alloqulov, a PhD student of my collaborator Prof. Bobomurat Ahmedov of National University of Uzbekistan on a project involving multimessenger astrophysics.

CONFERENCES WORKSHOPS SCHOOLS

15. YITP long-term workshop on Gravity and Cosmology 2024, Yukawa Institute of Theoretical Physics, Kyoto University, Kyoto, January-March 2024
14. 10th Bangkok Workshop on High-Tnergy Theory, Chulalongkorn university, Bangkok, Thailand, January 2023
13. Regular black holes in quantum gravity and beyond, Online, October-2021
12. 14th International Conference on Gravitation, Astrophysics and Cosmology, National Central University University, Jhongli, Taiwan, August-2022
11. Recent Progresses in Relativistic Astrophysics, Fudan University, Shanghai, China, May-2019
10. Asian-Pacific Winter School and Workshop on Gravitation and Cosmology, Yukawa Institute for theoretical Physics, Kyoto, Japan, February-2019
9. International Conference on Quantum Gravity, SUSTech, Shenzhen, China, March-2018
8. Thirty Meter Telescope-Science and Instrumentation Meeting, Tezpur University, Tezpur, India, December-2015
7. North-East Meet of Astronomers (NEMA), Tezpur University,Tezpur, India, November-2015
6. Workshop on Computational Aspects of Research in Physics, Tezpur university, Tezpur, India, October-2014

5. Pulsar Observatory for Students(POS-2014), TIFR Radio Astronomy Center, Ooty, India, July-2014
4. IUCAA-CCSU Summer School in Astronomy and Astrophysics, Cotton College State University (CCSU), Guwahati, Assam, June-2014
3. Radio Astronomy Winter School, National Center for Radio Astronomy (NCRA), Pune, India, December-2013
2. IUCAA sponsored workshop on IR astronomy and Data analysis, Tezpur University, Tezpur, India, March-2013
1. BITS-IUCAA Workshop on Gravitational Wave data analysis, BITS-Pilani, KK Birla Goa Campus, Goa, India, December-2012

COMPUTER SKILLS

- **Basic:** C, FORTRAN, Octave
- **Advanced numerical methods:** Python, Mathematica
- **Others:** LaTeX, Maple, Linux, GNU-plot

REFERENCES

- Prof. Cosimo Bambi
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  Email: bambi[AT]fudan.edu.cn

- Dr. Daniele Malafarina
  Associate Professor, Department of Physics
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- Dr. Debasish Borah
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- Dr. Yong Tang
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