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.

- Singularity resolution in theories beyond general relativity and quantum gravity, Non-singular solutions of gravity theories and gravitational collapse, singularity resolution in AdS/CFT.
- Modified gravity, tests of gravity with multi-messenger observations, black hole shadows and gravitational lensing.

EMPLOYMENT HISTORY

Postdoctoral Research Fellow 2021 - Present
University of Chinese Academy of Sciences, Beijing, PR China

- Recipient of Special Research Assitant fellowship
- Research on *Tests of gravity with multimessenger observations*

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, China

- Doctoral research in resolution of gravitational singularities and tests of gravity under the direction of Prof. Cosimo Bambi.
- Dissertation title: Singularity resolution in theories beyond General Relativity and some astrophyiscal 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.
Published:

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**, no.5, 373 (2020), [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** (2019) no.3, 179 [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** 1803 (2018) 013 [arXiv:1711.07198 [gr-qc]]

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 Organisation, 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 examimations
  Awarded by the Government of Assam, 2009

Invited Lectures (selection)

- 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* *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

1. Alexandra Demyanova, a PhD student of my collaborator Dr. Ahmadjon Abdujabbarov of National University of Uzbekistan on a project involving neutrino oscillations in modified gravity theories.

CONFERENCES WORKSHOPS SCHOOLS

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, GNU-plot
- **Others:** LaTeX, Maple, Linux

REFERENCES

- Prof. Cosimo Bambi
  Xie Xide Junior Chair Professor
  Department of Physics, Fudan University
  Email: bambi[AT]fudan.edu.cn

- Dr. Daniele Malafarina
  Associate Professor, Department of Physics
  Nazarbayev University
  Nursultan, Kazakhstan Email: daniele.malafarina[AT]nu.edu.kz

- Dr. Ahmadjon Abdujabbarov
  Associate Professor
  National University of Uzbekistan and Ulugh Beg Astronomical Institute
  Tashkent, Uzbekistan Email: ahmadjon[AT]astrin.uz

- Dr. Debasish Borah
  Associate Professor, Department of Physics
  Indian Institute of Technology (IIT), Guwahati, India
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- Dr. Yong Tang
  Assistant Professor, School of Astronomy and Space Sciences
  University of Chinese Academy of Sciences, Beijing
  Email: tangy[AT]ucas.ac.cn